



# BOOK OF ABSTRACTS & PROGRAMME

2<sup>nd</sup> Central European Symposium for Aquatic Macroinvertebrate Research (CESAMIR)



# **Book of abstracts and programme**

**2<sup>nd</sup> Central European Symposium  
for Aquatic Macroinvertebrate Research  
July 3–8 2016, Pécs, Hungary**

Edited by **Arnold Móra & Zoltán Csabai**

**Mohács – Pécs, 2016**



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How to cite:

Móra, A. & Csabai, Z. (eds.) *Book of abstracts and programme. 2nd Central European Symposium for Aquatic Macroinvertebrate Research (CESAMIR)*. Carpathes Nature Foundation, Mohács – Pécs, 136 pp.

**ISBN 978-963-12-5936-0**

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**Cover design: Zoltán Csabai**

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**Title pictures** (by courtesy of Arnold Móra):

up left: **Hármas-Körös River near Magyartés, Szentes**

up right: **a typical soda pan, the Fehér-tó at Kardoskút**

middle left: **a male Chironomidae**

middle right: ***Cordulegaster heros***

down left: **the Danube at Nyergesújfalu**

down right: **Nagy-Vasfazék stream, Börzsöny Mts.**

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## WELCOME MESSAGE

On behalf of the organizing committees, it is a great pleasure to welcome you to the 2<sup>nd</sup> Central European Symposium for Aquatic Macroinvertebrate Research (CESAMIR), held in Pécs, Hungary between 3<sup>rd</sup> and 8<sup>th</sup> of July, 2016. The organizers would like to thank you for your contribution to this event. We have made every effort to make your visit a pleasant and hopefully memorable one.

CESAMIR aims to integrate recent achievements of all branches of aquatic macroinvertebrate science, from basic to applied research, including but not limited to taxonomy, biodiversity and faunistics, community, functional and population ecology, water quality monitoring and metrics, from microhabitat modification to global changes, with a focus on the latest developments and trends, as well as future outlook. In 2014 the first Central European meeting was held in Szarvas, Hungary with about 80 participants. We trust to that CESAMIR will continue its way as a biannual symposium in the future, bringing together scientist from all around Europe who work in different areas of research on these fascinating groups of aquatic organisms.

The organizers hope that the 2<sup>nd</sup> CESAMIR provides a good opportunity to present latest results, discuss and share ideas, not only within the sessions but also during the "after hours". We hope you will enjoy not only the symposium, but the time spent in the amazing historical and natural environment of the city of Pécs.

We would like to thank the plenary lecturers for accepting our invitation to open the day to day scientific program, as well as those colleagues who chaired sessions and organized workshops. Finally, our thanks are due to all those colleagues who made their best to invite researchers, and all those organizers who helped to frame the program and background of the symposium.

Pécs, 03 July 2016

Zoltán Csabai & Arnold Móra

Chair of the Scientific Committee & the Local Committee

## ORGANIZING COMMITTEES

### SCIENTIFIC COMMITTEE

Chair:

**Zoltán Csabai** (University of Pécs, Hungary)

Members:

**David S. Boukal** (University of South Bohemia, Czech Republic)

**Tadeusz Fleituch** (Institute of Nature Conservation, PAS, Poland)

**Wolfram Graf** (BOKU Wien, Austria)

**Ladislav Hamerlík** (Matej Bel University, Slovakia)

**Oana Teodora Moldovan** (Institute of Speleology “Emil Racoviță”, RAS,  
Romania)

**Petr Pařil** (Masaryk University, Czech Republic)

**Momir Paunović** (IBISS, University of Belgrade, Serbia)

**Ana Previšić** (University of Zagreb, Croatia)

**Vladimir Pešić** (University of Montenegro, Montenegro)

**Gorazd Urbanič** (IzVRS, Slovenia)

**Yanka Vidinova** (Institute of Biodiversity and Ecosystem Research, BAS,  
Bulgaria)

### LOCAL COMMITTEE

Chair:

**Arnold Móra** (University of Pécs, Hungary)

Members:

**Pál Boda** (Department of Tisza River Research, CER HAS, Hungary)

**András Csercsa** (Department of Tisza River Research, CER HAS, Hungary)

**Valér Horvai** (Carpathes Nature Foundation, Hungary)

**Eszter Krasznai** (Department of Tisza River Research, CER HAS, Hungary)

**Péter Mauchart** (University of Pécs, Hungary)

**Adrienne Ortmann-Ajkai** (University of Pécs, Hungary)

**Bálint Pernecker** (University of Pécs, Hungary)

**Éva Horváth-Tihanyi** (University of Pécs, Hungary)

**Gábor Várbíró** (Department of Tisza River Research, CER HAS, Hungary)

# **PROGRAMME**

## **GENERAL INFORMATION**



## VENUE

### **Szentágothai Research Centre** of University of Pécs

The János Szentágothai Research Centre of the University of Pécs is a research institute established in 2012. It covers all aspects of education, research and innovation in biomedical, natural and environmental sciences.

More information: <http://www.szkk.pte.hu/en>

Lecture halls:

- "Kavics" Lecture hall for 300 people (plenaries and regular sessions)
- B001 Lecture hall for 140 people (regular sessions)
- B002 Lecture hall for 110 people (regular sessions, workshop)
- lobby for posters

### **How to reach Szentágothai Research Centre?**

Address: Ifjúság útja 20, H-7624 Pécs, Hungary

GPS Coordinates: 46°04'31.89"N, 18°12'14.22"E or  
46.075439°N, 18.203909°E

**WIFI** is available for free (Eduroam and University Guest networks).

**Free parking** is also available near to the Venue

## DURING THE SYMPOSIUM

### **Language:**

The official language of the symposium is English. There will be no provision for simultaneous translation into other languages.

### **Registration & information:**

All participants, including speakers, must register at the information desk and will receive an official conference package, the invoice, a "Certificate of attendance" and a name badge, and there will be an opportunity to upload their presentation file. Attendees will be requested about social events options.

Opening hours of the registration and information desk:

Sunday, 3 July	12:00 – 18:30
Monday & Tuesday, 4–5 July	08:30 – 19:00
Thursday & Friday, 7–8 July	during coffee breaks

### **Name badges:**

Every attendee **must wear** her/his official name badge visibly all time to enter the sessions, meals and social events.

### **Meals:**

The conference fee covers lunch (soup, two options of main course, dessert & fruits) on all days, welcome reception (Sunday) and conference dinner (Thursday, included only in FULL package). During the mid-conference trip lunch will be served on site (hot meal). Having the lunch please use the tickets which were provided during the registrations.

### **Accompanying persons**

Accompanying persons are also welcome on this meeting. Their registration package includes welcome reception, mid-conference field trip, guided tour in the Zsolnay Cultural Quarter and conference dinner.

## **SOCIAL EVENTS**

### **Welcome reception**

All participants are invited to attend on the Opening Ceremony & Welcome Reception from 18:30 to 22:00 on Sunday, 3 July, at the conference venue.

### **Pálinka Intercalibration Meeting & Dinner (optional program)**

All participants are invited to attend on the pálinka-tasting meeting from 20:00 to 24:00 on Monday, 4 July, in the Café Paulus. Tasting of 5 types × 2cl Pálinka (Hungarian fruit distillate) will be guided by an expert of the Brill Distillery and Pálinka House, “The most successful commercial distillery of Hungary, 2013”. Participation is based on preliminary application at the registration desk. Both the tasting and the à la carte dinner are at the participants’ own expense.

### **Mid-conference trip**

On Wednesday, 6 July, participants with FULL, STANDARD and ACCOMPANYING PERSON Packages will attend in an all-day-long mid-conference trip. We will go by buses to the Old-Drava Visitors Centre of the Duna–Drava National Park. It presents about the flora and fauna of the Drava River and its floodplains, life and traditional farming methods in the Ormánság region in the past, by means of an interactive exhibition, a farm display area and three study trails with different themes. During the day different study trails (long and short walks) are available to ensure the eventful participation. As an alternative, there will be an opportunity to visit the small city of Siklós, where the participants can see the Castle of Siklós and the city centre. For further information please check the detailed programme (page 21).

### **Guided tour in the Zsolnay Cultural Quarter & Conference Dinner**

Participants with FULL and ACCOMPANYING PERSON Packages are invited to attend on a guided tour in the Zsolnay Cultural Quarter at 16:30-18:30 on Thursday, 7 July. The tour will include famous buildings of the Zsolnay Cultural Quarter. The guides will tell about the story of the Zsolnay Family, the Zsolnay Porcelain Manufacture, the buildings and its recent function, and they will introduce the most famous porcelain collection, the Gyugyi collection in an exclusive exhibition house.

After the tour, at 19:00-23:00, a Conference Dinner will be provided in the Zsolnay Restaurant, in the heart of the Zsolnay Cultural Quarter.

## **INSTRUCTIONS**

### **For oral presenters**

- Talks except plenaries will be scheduled in 20-minute slots. We strongly encourage all presenters do not talk more than 15 minutes to allow 5 minutes for discussion and questions from the audience. Please note that the time limit will be strictly enforced by the session chairs to facilitate keeping the time schedule of the symposium.
- Speakers should provide their presentation file on a USB memory stick / Flash drive during the registration or coffee breaks at the information desk, but no later than 1 hour before their session. Speakers of the morning session, please hand over the day before.
- Presentation file must be compatible with Power-Point (\*.ppt, \*pptx) or Adobe (\*.pdf) formats. If you have special other needs (video, other file formats, etc.), please note your needs during the registration process and/or contact the organizing committee via e-mail before the Symposium.
- The name of the file should be as “name-session-slot”, for example JohnDoe-RS1-1.ppt
- The presentation files will be uploaded onto the hard drive of the computer in the lecture room before the session and removed afterwards by the symposium staff. A laser pointer will be provided for presentation. Please note that it is not possible to use your own computer.

### **For poster presenters**

- The maximum poster size is 120 cm (height) by 90 cm (width). The recommended size is the A0 portrait (118.9 cm × 84.1 cm).
- Short introductions during the poster sections will be scheduled in 7-minute time slots. Please do not be longer than 5 minutes to allow 2 minutes for short questions.
- Audiovisual equipment and additional presentation file is not allowed for poster presentations.
- The posters will be mounted on movable walls provided by the organizers and presented during the whole symposium. Materials for mounting will be provided, please do not use your own.
- Posters should be mounted no later than 1 hour before the beginning of the first poster session.

### **AWARDS**

#### *“Best poster prize”*

All presented posters will be judged by independent experts invited by the organizing committee. Main criteria: presentation of the scientific content, clarity, structure, design. Based on the proposal of the jury one poster will be awarded.

#### *“Best young speaker prize”*

Oral presentations are held by undergraduate students and PhD students will be judged by independent experts invited by the organizing committee. Main criteria: preparedness of the presenter, clarity, design. Based on the proposal of the jury one speaker will be awarded.

### **WORKSHOP**

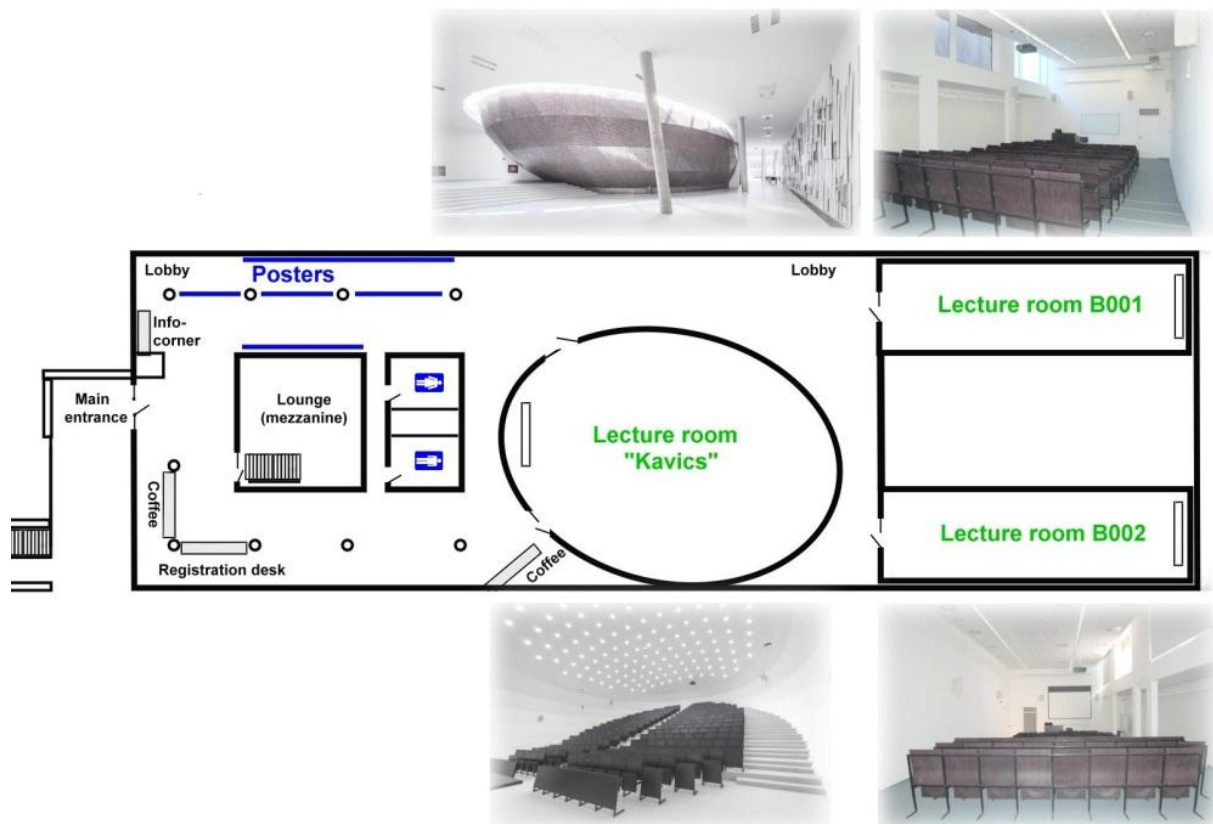
All participants are welcome in the workshop at Monday evening. It will be started by a short introduction, thereafter it will be opened for discussion.

# **SCIENTIFIC PROGRAMME**

**SUNDAY, 3 July**

18:30– 18:50	<b>OPENING CEREMONY</b> <b>“Kavics”</b>
	Welcome speech <b>Róbert GÁBRIEL</b> , dean of Faculty of Sciences, University of Pécs <b>Zoltán CSABAI</b> , chair of 2 <sup>nd</sup> CESAMIR Scientific Committee  Announcement of “Best young speaker prize” and “Best poster prize”
19:00– 22:00	<b>WELCOME RECEPTION</b> <b>Lobby</b>

**Floor map of the venue**





MONDAY, 4 July

**PLENARY I**  
**“Kavics”**

09:00– Michał GRABOWSKI:  
10:00 **European freshwater biota – from rise of the continent to human impact**

10:00–10:30 Coffee break

**OS-01 BIOGEOGRAPHY**  
**“Kavics”**

Chair: Fedor ČIAMPOR Jr

10:30– Simon VITECEK, Ana PREVIŠIĆ, Mladen KUČINIĆ, Lujza KERESZTES, Miklós BÁLINT, Johann  
10:50 WARINGER, Steffen PAULS, Wolfram GRAF: **The Balkan grazer group (Drusinae, Limmnephilidae, Trichoptera): phylogeny, morphology and distribution of enigmatic endemics**

10:50– Zohar YANAI, Jean-Luc GATTOLLIAT, Michel SARTORI, Netta DORCHIN: **Challenges in research and conservation of mayflies (Ephemeroptera) in the Middle East**  
11:10

11:10– Pavel PEŠEK, Veronika SACHEROVÁ, Hana RYCHTRMOCOVÁ: **Double origin of Central European fairy shrimp *Eubranchipus grubii***  
11:30

11:30– Tomasz MAMOS, Krzysztof JAŹDŹEWSKI, Michał GRABOWSKI: **Cryptic refugia and postglacial colonisation in the northern Carpathians. Case study of *Gammarus balcanicus* (Crustacea, Amphipoda)**  
11:50

12:00–13:00 Lunch

**OS-02 BEHAVIOURAL ECOLOGY**  
**B001**

Chair: David S. BOUKAL

13:00– Martin ČERNÝ, Dominika DUBCOVÁ, Lenka  
13:20 HUPKOVÁ: **Epigamic behavior of Golden-ringed Dragonfly (*Cordulegaster boltonii*)**

13:20– Bálint PERNECKER, Réka BODA, Péter  
13:40 MAUCHART, Arnold MÓRA, Zoltán CSABAI: **Disentangling the effects of life history and weather parameters on the emergence behaviour of Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979)**

13:40– Ádám EGRI, Alexandra FARKAS, Gábor  
14:00 HORVÁTH, György KRISKA: **Polarization sensitivity in the water-surface-inhabiting springtail, *Podura aquatica***

14:00– Péter MAUCHART, Bálint PERNECKER, Estera  
14:20 GARAJOVÁ, Eszter SEBESTYÉN, Tomáš ONDÁŠ, David S. BOUKAL, Zoltán CSABAI: **Are diving beetles larks or owls? Pilot study on the diurnal rhythms of movement and air uptake behavior of *Cybister lateralmarginalis* De Geer, 1774**

**OS-03 MONITORING & ASSESSMENT I**  
**B002**

Chair: Gábor VÁRBIRO

Ivana POZOJEVIĆ, Jasna LAJTNER, Josip  
RUBINIĆ, Ivica BARAČ, Sanja GOTSTEIN: **Key zoobenthos inhabitants as indicators of hydrological dynamics in karst springs**

Valentina SLAVEVSKA-STAMENKOVIĆ, Biljana RIMCHESKA, Slavčo HRISTOVSKI, Maja RAKOVIĆ, Stoe SMILJKOV, Vanja MARKOVIĆ, Momir PAUNOVIĆ: **Indicative ecological status assessment of the Sturmica river catchment based on macroinvertebrates – a case study**

Rabia SOUFI, Violeta TYUFEKCHIEVA, Vesela EVTIMOVA, Yanka VIDINOVA, Maria KERAKOVA-GELEVA, Galia GEORGIEVA, Stefan STOICHEV, Ivailo DEDOV: **Preliminary data on the “intercalibration exercise” of different river types in Bulgaria using benthic macroinvertebrates**

Gencer TÜRKMEN, Nilgün KAZANCI: **Habitat quality assessment of streams in Altindere Valley National Park (Trabzon, Turkey) using physico-chemical variables and various biotic indices based on benthic invertebrates**

14:30–15:00 Coffee break

15:00–  
18:00

**PS-01 POSTER SESSION I**  
**Lobby**

Chairs: Marko MILIŠA, Yanka VIDINOVA

COMMUNITY ECOLOGY & FOOD WEBS

- 1 Anita GALIR BALKIĆ, Ivančica TERNJEJ: **How do different metazooplankton groups (Rotifera, Cladocera, Copepoda) respond to community stress caused by flooding? A case study from Danubian floodplain Lake (Kopački rit, Nature Park)**

- 2 Ivana PUŠIĆ, Jasmina ŠARGAČ: **Differences in community structure of benthic macroinvertebrates of Rječina River (SW Croatia) due to construction of dam and adjacent reservoir**

- 3 Marina VILENICA, Ana PREVIŠIĆ, Mladen KUČINIĆ, Vlatka MIČETIĆ STANKOVIĆ, Michel SARTORI, Zlatko MIHALJEVIĆ: **Seasonal dynamics of mayflies in karstic habitats in the Dinaric Western Balkan Region**

- 4 Barbara VLAČEVIĆ, Jasna VIDAKOVIĆ: **Primary colonization process of ciliated protozoa in a temperate floodplain lake periphyton**

CONSERVATION, MANAGEMENT & RESTORATION ECOLOGY

- 5 Michaela ČERNÁ, Kateřina RAMBOUSKOVÁ, Ondřej SIMON, Miriam JANDÁKOVÁ, Vojtěch BARÁK, Michal BILÝ, Kamila TICHÁ, Jan ŠVANYGA: **Hot news from the pearl mussel river Teplá Vltava in the Czech Republic**

CONSERVATION, MANAGEMENT & RESTORATION ECOLOGY

- 6 Biljana RIMCHESKA, Valentina SLAVEVSKA-STAMENKOVIĆ, Yanka VIDINOVA, Momir PAUNOVIĆ, Bojana TUBIĆ, Nikola MARINKOVIĆ, Jelena ČANAK ATLAGIĆ, Svetoslav CHESHMEDJIEV: **New data about distribution of *Thremma anomalum* McLachlan, 1876 (Insecta: Trichoptera) in Balkans**

- 7 Jan SPACEK: **Evaluation of acidification and the current ecological status of streams on the Czech part of Krkonose (Giant) Mts.**

GLOBAL CHANGES & INVASIVE SPECIES

- 8 Barbora LOSKOTOVÁ, Michal STRAKA, Petr PAŘIL: **Usability of aquatic macroinvertebrates from bottom sediments for the bioindication of drought duration in streams**

- 9 Petr PAŘIL, Světlana ZAHŘÁDKOVÁ, Ondřej HÁJEK, Pavel TREML, Michal STRAKA, Denisa NĚMEJCOVÁ, Marek POLÁŠEK, Pavel ONDRÁČEK: **Risk assessment of drying up of small streams in the Czech Republic**

- 10 Krešimir ŽGANEC, Renata ČUK, Svjetlana DEKIĆ, Marko MILIŠA: **Biocontamination of benthic macroinvertebrate communities of four major large rivers in Croatia**

HUMAN IMPACT, WATER POLLUTION & TOXINS

- 11 Bettina ECK-VARANKA, Nóra KOVÁTS, Gábor PAULOVITS, Katalin HUBAI, Árpád FERINCZ, Eszter HORVÁTH: **Assessment of allelopathic aquatic plants: evaluating genotoxic effect using the mussel micronucleus test**

- 12 Nilgün KAZANCI, Özge BAŞÖREN: **Influence of physicochemical characteristics of habitats on distribution of Simuliidae (Insecta: Diptera) species in Mediterranean climate running waters**

- 13 Milica STOJKOVIĆ PIPERAC, Djuradj MILOŠEVIĆ, Dubravka ČERBA, Ana PETROVIĆ, Momir PAUNOVIĆ, Vladica SIMIĆ: **How different taxonomic groups within macroinvertebrate community influence the strength of taxonomic distinctness index in lotic systems**

- 14 Jan ŠUPINA, Jindřiška BOJKOVÁ: **Intraspecific variability in fecundity of *Leptophlebia vespertina* (Ephemeroptera: Leptophlebiidae) in seven acidified lakes in the Bohemian Forest**

PALEOLIMNOLOGY

- 15 Daniela DOBŘÍKOVÁ, Ladislav HAMERLÍK, Ferdinand ŠPORKA, Peter BITUŠÍK: **Subfossil chironomid communities (Diptera: Chironomidae) from sediments of lake Popradské pleso indicate climatic oscillations in the last millenium**

15:00–  
18:00

**PS-01 POSTER SESSION I**  
**Lobby**

POPULATION ECOLOGY

- 16 Alena DOSTÁLOVÁ, Petr PAŘIL: **Is it better to be big and old or small and young to overcome drought? – a case study of *Gammarus fossarum* after-drought recolonization of intermittent streams**

WATER QUALITY MONITORING & METRICS

- 17 Nilgün Kazancı: **Evaluation of Plecoptera (Insecta) community composition using multivariate technics in a biodiversity hotspot**

- 18 Jasmina ŠARGAČ, Mladen KEROVEC, Zoran ŠARGAČ: **How different impacts affect benthic macroinvertebrate communities in the same water body type – case study for the upper course of Lonja River (NW Croatia)**

- 19 Katarina ZORIĆ, Maja RAKOVIĆ, Božica VASILJEVIĆ, Ana ATANACKOVIĆ, Marija ILIĆ, Aljoša TANASKOVIĆ, Momir PAUNOVIĆ: **Ecological status of three reservoirs in sub-urban area of Belgrade (Serbia) based on macroinvertebrate assemblages**

18:00–  
19:30

**WORKSHOP**

Moderator: Tadeusz FLEITUCH

**Effects of climate changes on macroinvertebrate functions in urban streams**

Urban fluvial systems present similar symptoms of stream ecosystem degradation around the world. However, awareness is growing that the mechanisms and severity of the symptoms differ among ecoregions. Climate is a key contributor to these differences. We discuss the direct and indirect pathways by which climate shapes the structure and function of benthic communities in urban streams and how differences in climate may affect them and how the urban stream syndrome is manifested. Mechanisms linking urbanization with ecological degradation, even when responses are similar, can differ among climate types, biomes, and geographical coordinates etc. Limited research has been done on the role of climate in stream macroinvertebrate response to urbanization. Controlled, large-scale studies are needed to address this issue, particularly because climate may covary with types of infrastructure and technological capabilities across the globe. Understanding the linkages between climate and urban stream ecosystems will improve understanding of urban streams and ability to implement management strategies.

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20:00–

**PÁLINKA INTERCALIBRATION**  
**Café Paulus**

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TUESDAY, 5 July

**PLENARY II**  
**“Kavics”**

- 09:00–  
10:00 Florian LEESE:  
**From genes to ecosystems: Assessing stressor effects on freshwater macroinvertebrates with genomic approaches**

10:00–10:30 Coffee break

**OS-04 CONSERVATION & MANAGEMENT I**  
**“Kavics”**

Chair: Momir PAUNOVIĆ

- 10:30–  
10:50 Gábor HORVÁTH, Bruce ROBERTSON, Desiree CAMPBELL, Colyer DUROVICH, Ian HETTERICH, Julia LES: **Polarized versus unpolarized light pollution in triggering ecological traps for nocturnally-active insects**
- 10:50–  
11:10 Tadeusz FLEITUCH: **Microplastics – silent killer of freshwater communities**
- 11:10–  
11:30 Vesna PETKOVSKA, Gorazd URBANIČ, Nataša SMOLAR-ŽVANUT, Darko ANZELJC: **What is an ecological flow supporting EU Water Framework Directive objectives in small alpine rivers?**
- 11:30–  
11:50 Yaron HERSHKOVITZ, Daniel HERING, Gideon GAL: **The ESSESMENT project: setting the scene for the ecological management of a multiple-stressed region**

12:00–13:00 Lunch

**OS-05 MONITORING & ASSESSMENT II**  
**B001**

Chair: Tadeusz FLEITUCH

- 13:00–  
13:20 Djuradj MILOŠEVIĆ, Milica STOJKOVIĆ PIPERAC, Dubravka ČERBA, Ana PETROVIĆ, Momir PAUNOVIĆ, Vladica SIMIĆ: **Macroinvertebrate taxonomic groups necessary for the reliable calculation of taxonomic distinctness index: potential metric for water and habitat quality assessment**
- 13:20–  
13:40 Özge BASÖREN, Nilgün KAZANCI: **Water quality assessment of Fırtına Stream using various macroinvertebrate-based metrics and physico-chemical variables**
- 13:40–  
14:00 Silviu BERCEA, Ruxandra NASTASE-BUCUR, Marius KENESZ, Silviu CONSTANTIN, Oana Teodora MOLDOVAN: **Aquatic microorganisms and invertebrates monitoring in Romanian show caves**
- 14:00–  
14:20 Petr PAŘIL, Vít SYROVÁTKA, Světlana ZÁHRÁDKOVÁ, Michal STRAKA, Marek POLÁŠEK, Denisa NĚMEJCOVÁ, Libuše OPATŘILOVÁ, Lenka ŠIKULOVÁ, Pavla ŘEZNÍČKOVÁ: **New method for retrospective bioindication of stream drying up based on the analysis of taxonomical and functional composition of aquatic macroinvertebrates**

**OS-06 MISCELLANEOUS**  
**B002**

Chair: Adrienne ORTMANN-AJKAI

- Béla CSÁNYI, Momir Paunović, József SZEKERES: **Problems of detecting mussel populations in large rivers**
- Oana Teodora MOLDOVAN: **Spatial and temporal scales in groundwater ecology**
- Vivien VISKI, Csaba DEÁK, István GRIGORSZKY, Eszter Á. KRASZNAI, Gábor VÁRBÍRÓ: **Microscale land use patterns and its effect on a lowland stream’s resilience of aquatic macroinvertebrate community**
- 

14:30–15:00 Coffee break

OS-07 COMMUNITIES I B001		OS-08 CONSERVATION & MANAGEMENT II B002	
Chair: Djuradj MILOŠEVIĆ		Chair: Martin ČERNÝ	
15:00– 15:20	<u>Mojca HROVAT</u> , Gorazd URBANIČ: <b>Ephemeroptera, Plecoptera and Trichoptera assemblages on the interplay between natural and human-induced factors in different types of karst river ecosystems</b>		<u>Pál BODA</u> , Arnold MÓRA, Gábor VÁRBÍRÓ, Zoltán CSABAI: <b>Downtown versus suburban residents: surrounding habitats helps to maintain macroinvertebrate diversity of a shallow marsh system</b>
15:20– 15:40	<u>Renáta SZITA</u> , András AMBRUS: <b>Longitudinal and temporal changes in functional feeding groups of aquatic macroinvertebrates along a given stream</b>		<u>Vojtěch KOLÁŘ</u> , Tomáš ONDÁŠ, David S. BOUKAL: <b>What do diving beetles say about fishponds management?</b>
15:40– 16:00	<u>Eszter Á. KRASZNAI</u> , Pál BODA, András CSERCSEA, Csaba DEÁK, Arnold MÓRA, Ildikó SZIVÁK, Gábor VÁRBÍRÓ: <b>Functional composition of macroinvertebrate communities in two sub-basins of the Tisza River</b>		Anna FARKAS, <u>Arnold MÓRA</u> : <b>Mortality during emergence in <i>Gomphus flavipes</i> and <i>G. vulgatissimus</i> (Odonata: Gomphidae): effects of emergence strategy and environmental conditions</b>
16:00– 16:20	<u>Tomáš ONDÁŠ</u> , Vojtěch KOLÁŘ, Jan KLEČKA, Václav KŘIVAN, David S. BOUKAL: <b>Determinants of community structure of large aquatic insects (Heteroptera and Coleoptera: Dytiscidae, Hydrophilidae) in space and time: a pond case study</b>		<u>Marek POLÁŠEK</u> , Světlana ZAHŘÁDKOVÁ, Denisa NĚMEJCOVÁ: <b>Long-term changes in biodiversity of running waters: preliminary analysis of mayfly assemblages in the Czech Republic over last three decades</b>
16:30–17:00 Coffee break			
17:00– 20:00	<b>PS-02 POSTER SESSION II Lobby</b>		
Chairs: Csaba DEÁK, András AMBRUS			
BIODIVERSITY & FAUNISTICS			
1	<u>Pavel BERACKO</u> , Katarína GREGUŠOVÁ, Andrea RUFUSOVÁ, Tomáš DERKA, Alexandra ROGÁNSKA: <b>Benthic life in karst springs</b>		
2	<u>Gavril Marius BERCHI</u> , Petr KMENT, Denis COPILAȘ-CIOCIANU, László RÁKOSY, Jakob DAMGAARD: <b>Water treaders of Romania and adjacent countries and their phylogenetic relationships (Hemiptera: Heteroptera: Mesoveliidae)</b>		
3	<u>Zuzana ČIAMPOROVÁ-ZAŤOVIČOVÁ</u> , Darina ŠÍPOŠOVÁ, Fedor ČIAMPOR Jr: <b>Small but diverse – alpine ponds as important source of genetic variability</b>		
4	<u>Anđela ČUKUŠIĆ</u> , Martina PODNAR, Mladen KUČINIĆ: <b>DNA barcoding caddisflies (Trichoptera) fauna in Croatia</b>		
5	<u>Jelena ĐUKNIĆ</u> , Bojana TUBIĆ, Vanja MARKOVIĆ, Jelena ČANAK ATLAGIĆ, Stefan ANDUS, Margareta KRAČUN-KOLAREVIĆ, Momir PAUNOVIĆ: <b>Aquatic macroinvertebrate assemblages of mountainous rivers in the Sutjeska National Park (Southeastern Bosnia and Herzegovina)</b>		
6	<u>Bronislava JANIČKOVÁ</u> , Leopold FÜREDER, Jana FEHÉROVÁ, Maria LEICHTFRIED, Petr PYSZKO, Vladimír UVÍRA: <b>Effect of climatic and hydrological conditions on the emergence of stoneflies (Plecoptera, Leuctridae) in an Alpine stream</b>		
7	<u>Miran KOH</u> , Viktorija ERGOVIĆ, Dubravka ČERBA, Zlatko MIHALJEVIĆ, Ladislav HAMERLÍK: <b>A literature review of the Chironomidae (Diptera) of Croatia: a platform for the first comprehensive check list of Croatian chironomids</b>		
8	<u>Mladen KUČINIĆ</u> , Anđela ČUKUŠIĆ, Renata ČUK, Darko CERJANEC, Ivan VUČKOVIĆ, Petar CRNČAN, Iva MIHOCI, Hrvoje PLAVEC, Ana PREVIŠIĆ, Miro LANDEKA, Ante DELIĆ, Sanja ŽALAC, Martina PODNAR, Mato BUČAR, Branimir GJURAŠIN: <b>Trichoptera research within project “EU Natura 2000 Integration Project (NIP)” in Croatia</b>		
9	<u>Arnold MÓRA</u> , Nándor SOÓS, Zoltán CSABAI: <b>Aquatic Coleoptera (Hydradephaga, Hydrophiloidea, Hydraenidae) and Heteroptera (Nepomorpha and Gerromorpha) fauna of Greek holiday islands (Rhodes, Crete and Corfu)</b>		

17:00–  
20:00

**PS-02 POSTER SESSION II  
Lobby**

- 10 Arnold MÓRA, József SZEKERES, Zoltán CSABAI, Anna FARKAS: **A comparison of collecting larvae and exuviae: which is more efficient to find rare riverine dragonfly species?**
- 11 Biljana RIMCHESKA, Yanka VIDINOVA, Valentina SLAVEVSKA-STAMENKOVIĆ: **New and rare mayfly species (Ephemeroptera: Heptageniidae) for the fauna of R. Macedonia**
- 12 Jan SPACEK: **Current knowledge of the water mites (Hydrachnellae and Halacaridae) fauna of the Czech and Slovak Republics**
- 13 Veronika ŠTILLOVÁ, Marcela PRIDALOVÁ, Marek SVITOK, Milan NOVIKMEC, Zuzana MATUŠOVÁ, Ladislav HAMERLÍK: **Check-list of Chironomidae (Diptera: Nematocera) in Central European ponds (Slovakia)**
- 14 Gencer TÜRKMEN, Nilgün KAZANCI: **Habitat characteristics of little-known species *Baetis milani* Godunko, Prokopov & Soldan 2004 (Ephemeroptera, Insecta) from the Eastern part of Black Sea Region (Turkey)**
- 15 Zsófia VARGA, Bálint PERNECKER, Réka BODA, Péter MAUCHART, Arnold MÓRA, Zoltán CSABAI: **Are there any differences between the populations of Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979) based on exuviae body dimensions? – A small scale study**
- 16 Jasna VIDAKOVIĆ, Dubravka ČERBA, Ivana TURKOVIĆ ČAKALIĆ, Barbara VLAČEVIĆ: **Periphytic invertebrate community on artificial substrata in a floodplain lake**
- 17 Marina VILENICA, Andreja BRIGIĆ, Mladen KEROVEC, Sanja GOTTSTEIN, Ivančica TERNJEJ: **Spatial and seasonal variation of mayflies (Insecta, Ephemeroptera) in the Đon močvar peat bog, Croatia**
- 18 Ivan VUČKOVIĆ, Renata ČUK, Iva VIDAKOVIĆ, Mladen PLANTAK, Mladen KUČINIĆ: **Distribution of the genus *Ecclisopteryx* (Insecta: Trichoptera) in Croatia**
- 19 Sanja ŽALAC, Renata ČUK, Ivan VUČKOVIĆ, Darko CERJANEC, Mladen PLANTAK, Mladen KUČINIĆ: **Faunal features of caddisflies (Insecta, Trichoptera) in spring habitats of Dinaric karst**
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**WEDNESDAY, 6 July**

09:00– 18:30	<b>MID-CONFERENCE FIELD TRIP</b> <b>Duna-Dráva National Park</b>
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09:00	Departure from the Boszorkány Hostel
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09:15	Departure from the Venue
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10:00– 12:00	Guided tour in the exhibition and in the farming area including the Traditional farming study trail.
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12:00– 13:00	Lunch
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13:00– 18:00	<b>OPTIONAL PROGRAMMES</b>		
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	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
13:00	<b>Long trip</b> (5 hours): 12km walk along the oxbows, side-arms and Drava River including Wildlife of the Drava study trail and Old Drava study trail.	<b>Short trip</b> (2 hours): 3km walk along the oxbows including Old Drava study trail.	<b>Siklós Castle &amp; City:</b> After lunch the bus will take participants to the small city of Siklós, where they can see the Castle and the city centre without any guidance.
15:00	Professional guidance provided	Stay at the visitors centre.	Visit Siklós Castle & City

~18:00	Leaving to Pécs
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THURSDAY, 7 July

**PLENARY III**  
**“Kavics”**

09:00–  
10:00 David BILTON:  
**Comparative ecophysiology, rarity and vulnerability to global change in aquatic insects**

10:00–10:30 Coffee break

**OS-09 INVASIVE SPECIES**  
**“Kavics”**

Chair: Thomas HORVATH

10:30–  
10:50 Michał RACHALEWSKI, Jarosław KOBAK, Karolina BAĆELA-SPYCHALSKA: **Conquerors or exiles? Impact of interference competition among invasive gammarideans on their dispersal rates**

10:50–  
11:10 Carola WINKELMANN, Susanne WORISCHKA, Jochen BECKER, Franz SCHÖLL, Claudia HELLMANN: **The impact of the invasive *Dikerogammarus villosus* on benthic communities**

11:10–  
11:30 Péter BORZA, Thomas HUBER, Patrick LEITNER, Nadine REMUND, Wolfram GRAF: **Niche differentiation of invasive Ponto-Caspian gammarids (Crustacea: Amphipoda) – insights from the 3<sup>rd</sup> Joint Danube Survey**

11:30–  
11:50 Renata MATONIČKIN KEPČIJA, Zlatko MIHALJEVIĆ, Marko MILIŠA, Marija IVKOVIĆ, Mirela SERTIĆ PERIĆ: **First record of freshwater jellyfish *Craspedacusta sowerbii* in a Mediterranean karstic river Krka (Croatia) and a promising method for polyp detection**

12:00–13:00 Lunch

**OS-10 MONITORING & ASSESSMENT III**  
**B001**

Chair: Nilgün KAZANCI

13:00–  
13:20 Ladislav HAMERLÍK, Daniela DOBRÍKOVÁ, Lucia SOCHULIAKOVÁ, Jaroslav STOKLASA, Peter BITUŠÍK: **Comparison of indicator potential of subfossil chironomids, diatoms and cladocerans: a paleolimnological perspective**

13:20–  
13:40 Gábor VÁRBÍRÓ, Eszter Á. KRASZNAI, András CSERCSEA, Pál BODA: **The “first” ten years of aquatic macroinvertebrate-based water quality monitoring in Hungary**

13:40–  
14:00 Maja SEVER, Bernarda ROTAR: **Monitoring and assessment of ecological status of rivers in Slovenia using benthic invertebrates**

14:00–  
14:20 Nikola MARINKOVIĆ, Nataša POPOVIĆ, Bojana TUBIĆ, Jelena TOMOVIĆ, Maja RAKOVIĆ, Vesna ĐIKANOVIĆ, Momir PAUNOVIĆ: **Ecological potential of the Serbian stretch of the Danube River based on macroinvertebrate communities – 2014-15 case study**

**OS-11 BIODIVERSITY I**  
**B002**

Chair: Mladen KUČINIĆ

Pavel SROKA, Jindřiška BOJKOVÁ, Tomáš SOLDÁN, David S. BOUKAL: **Quantifying the variation of fecundity in mayflies (Insecta: Ephemeroptera)**

Anamarija RIDL, Marija IVKOVIĆ, Zlatko MIHALJEVIĆ, Ana PREVIŠIĆ: **Caddisflies (Trichoptera, Insecta) of Mediterranean tufa barriers: specific communities of unique habitats**

Jana ZAJACOVÁ, Lenka HUBÁČKOVÁ, Jindřiška BOJKOVÁ: **Diversity of caddisflies (Trichoptera) in springbrooks of the Western Carpathian spring fens: Are their assemblages distinct from neighbouring streams?**

Vendula POLÁŠKOVÁ, Jana SCHENKOVÁ, Martina BARTOŠOVÁ, Vanda RÁDKOVÁ: **Aquatic invertebrates of calcareous wetlands in post-mining landscape: a comparison with natural calcareous fens**

14:30–15:00 Coffee break

**OS-12 STREAM ECOLOGY  
B001**

Chair: Petr PARIL

15:00–  
15:20 Mirela SERTIĆ PERIĆ, Ines RADANOVIĆ, Renata MATONIČKIN KEPČIJA, Biserka PRIMC, Ivan HADŽIJA: **Diel drift patterns of macroinvertebrates within a tufa-precipitating hydrosystem (Plitvice Lakes National Park, Croatia)**

15:20–  
15:40 Agnija SKUJA, Ilga KOKORITE, Agrita BRIEDE: **Dynamics of benthic macroinvertebrate colonisation in leaf breakdown experiment in small rhithral streams in Latvia**

15:40–  
16:00 Ildikó SZIVÁK, Pál BODA, Gábor VÁRBIRÓ, András CSERCSA, Eszter Á. KRASZNAI, Arnold MÓRA, Diána ÁRVA, Mónika TÓTH, Tibor ERŐS: **Occupancy frequency distribution in stream insects: effect of habitat type, niche characteristics and dispersal ability**

**OS-13 BIODIVERSITY II  
B002**

Chair: Ladislav HAMERLÍK

Jan SYCHRA, Lukáš MERTA, Vít ZAVADIL: **Large branchiopods (Branchiopoda: Anostraca, Notostraca, Spinicaudata) as pilgrims in time and space in Central Europe**

Martina BILKOVÁ, Jana SCHENKOVÁ: **Clitellate assemblages of spring fens in Slovakia with a focus on a fen specialist *Trichodrilus strandi* (Lumbriculidae)**

Marija IVKOVIĆ, Adrian C. PONT: **Long-time emergence patterns of *Limnophora* species in specific karstic habitats: tufa barriers**

16:30–  
19:00 **GUIDED TOUR & GYUGYI PORCELAIN COLLECTION**  
Zsolnay Cultural Quarter

19:00–  
22:00 **CONFERENCE DINNER**  
Zsolnay Restaurant

FRIDAY, 8 July

**PLENARY IV**  
**“Kavics”**

09:00– Pavel KRATINA:  
10:00 **Indirect impacts of climate warming in pelagic and benthic food webs**

10:00–10:10 Coffee break

**OS-14 FOOD WEBS**  
**“Kavics”**

Chair: Carola WINKELMANN

10:10– Arnaud SENTIS, Charlene GEMARD, Baptiste JAUGEON, Julie MORISSON, David S. BOUKAL:  
10:30 **Impacts of climate change on food webs: role of individual phenotypic plasticity and non-trophic interactions**

10:30– Alexander DÜRREGGER, Günther UNFER, Wolfram GRAF: **Feeding ecology of the Brown Trout (*Salmo trutta*) in two salmonid streams of the Bohemian Massif and the northern Limestone Alps under special consideration of Ephemeroptera-Plecoptera-Trichoptera Taxa**

10:50– Libor MIKL, Zdeněk ADÁMEK, Lucie VŠETIČKOVÁ, Michal JANÁČ, Kevin ROCHE, Luděk  
11:10 ŠLAPANSKÝ, Pavel JURAJDA: **Benthic macroinvertebrate assemblage response to round (*Neogobius melanostomus*) and tubenose (*Proterorhinus semilunaris*) goby predation pressure**

11:10– Alexandra HENCZ, Bálint PERNECKER, Réka BODA, Péter MAUCHART, Arnold MÓRA, Zoltán  
11:30 CSABAI: **Seasonal and spatial differences in the trophic spectrum of Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979) in the Mecsek Mountains, SW Hungary**

11:30–11:40 Coffee break

**OS-15 COMMUNITIES II**  
**B001**

Chair: Oana Teodora MOLDOVAN

11:40– Pavel SOUKUP, Michal ŠORF, Jan KLEČKA, David  
12:00 S. BOUKAL: **The effect of predation risk and habitat complexity on community assembly in small standing waters**

12:00– Márk FICSÓR: **The influence of abiotic environmental factors on the regional distribution of larval net-spinning caddisfly species (Trichoptera: Hydropsychidae) in Northern Hungary and in the Northern Great Plain**

12:20– András CSERCSEA, Ildikó SZIVÁK, Gábor VÁRBÍRÓ,  
12:40 Eszter Á. KRASZNAI, Péter MAUCHART, Arnold MÓRA, Diána ÁRVA, Mónika TÓTH, Tibor ERÓS, Pál BODA: **Relative roles of environmental and spatial factors in determining macroinvertebrate metacommunity structure in riverine systems**

12:40– Marko MILIŠA, Marina TETKOV:  
13:00 **Macroinvertebrate colonization and organic matter transport in moss mats at tufa barriers**

**OS-16 TAXONOMY**  
**B002**

Chair: Arnold MÓRA

Vladimir PEŠIĆ, Harry SMIT: **Evidence of cryptic and pseudocryptic speciation in *Brachypodopsis baumi* species complex (Acari, Hydrachnidia, Aturidae) from Borneo, with description of three new species**

Fedor ČIAMPOR JR., Zuzana ČIAMPOROVÁ-  
ZATOVIČOVÁ: **Riffle beetles DNA Barcoding (Coleoptera: Elmidae) – past, present and future**

Denis COPILAS-CIOCIANU, Cene FIŠER, Péter BORZA, Gergely BALÁZS, Dorottya ANGYAL, Adam PETRUSEK: **A comparative study of two epigeal *Niphargus* species: phylogenetic relationships, phylogeography, morphology and ecology**

Kamil HUPAŁO, Tomasz MAMOS, Weronika OLSZEWSKA, Marta ŚWIDNICKA, Ioannis KARAOUZAS, Wanda PLAITI, Michał GRABOWSKI: **Diversity and origin of freshwater gammarids from Crete and Peloponnese**

13:00–  
13:10

**AWARDS & CLOSING CEREMONY**

Best young speaker prize  
Best poster presentation prize

13:10–14:30 Lunch

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# **ABSTRACTS**



# **Plenary lectures**

**PLENARY I**  
**MONDAY, 4 JULY, 09:00**

## **European freshwater biota - from rise of the continent to human impact**

Michał GRABOWSKI

University of Łódź, Łódź, Poland

In general view, Europe is recognised as less interesting field for biodiversity studies than the tropical regions of the world. Such opinion is biased mostly by comparably low number of formally described species especially in such flagship taxa as vertebrates, insects or molluscs and by the believable calamitous role of Pleistocene glaciations in shaping European biodiversity.

Such view has begun to change with, published nearly twenty years ago, works upon “genetic legacy of Quaternary ice ages” by the late Godfrey Hewitt and his team. This already classical set of publications presented an intricate pattern of distribution of numerous phylogenetic lineages within formally recognised species, surviving and diversifying during ice ages in several southern glacial refugia and then recolonising more northern regions of Europe. Numerous further studies have brought even more intriguing information, particularly in case of freshwater biota. Unexpected presence of glacial refugia was discovered in northern regions of Europe. In case of several groups, such as crustaceans, extraordinarily high level of cryptic diversity and deep divergence within morphospecies were revealed. This showed that their evolutionary history in Europe reaches far beyond Pleistocene and dates back to the very beginning of Europe as a continent that we know now. The knowledge questioned the widely accepted Banarescu’s view on biogeography of freshwaters in Europe. Looking at the new level of diversity has also greatly enhanced taxonomic studies and affected the rationale behind nature conservation.

Such accumulation of information upon the real extent of diversity and origins of European freshwater biota has overlapped in time with ongoing colonisation of local inland waters by various nonindigenous invasive species. Their routes and pathways of dispersal as well as consequences for local ecosystems are another fascinating research program. During my talk I will provide the audience with outline of the dynamic changes of European paleogeography and associated climate changes, showing how they affected the present day diversity and distribution of main freshwater taxonomic groups. I will also cover the most recent changes in biodiversity patterns in inland waters due to spread of invasive species. The talk will be illustrated with a wide selection of case studies coming both from my team’s published and unpublished works as well as from other sources.

**PLENARY II**  
**TUESDAY, 5 JULY, 09:00**

## **From genes to ecosystems: Assessing stressor effects on freshwater macroinvertebrates with genomic approaches**

Florian LEESE

University of Duisburg-Essen, Essen, Germany

As a consequence of anthropogenic action, freshwater ecosystems have been drastically degraded over the past centuries with severe consequences for biodiversity and ecosystem function. To counteract degradation, many restoration efforts from small and local to large international catchment-spanning activities have been launched. Here, macroinvertebrates are central indicators to quantify the loss of biodiversity in response to anthropogenic stressors and its subsequent recovery. Unfortunately, determination of macroinvertebrates with morphological methods, specifically of their juvenile stages, is difficult and frequently leads to incorrect results. In addition, the level of genetic variation is not included in the contemporary approaches. Therefore, current assessments are limited in their power to gain deeper process understanding. In my talk I will outline how genetic and genomic tools can be routinely applied to study responses of macroinvertebrates to stressors. Using case studies from Europe and New Zealand, I will outline how the impact of stressors on populations can be studied using genetic and genome-wide polymorphism data. The data show that critically important responses of biodiversity are overlooked when only relying on morphological data. Second, I will show how DNA-metabarcoding can be routinely integrated into present-day biodiversity assessment to improve biodiversity – ecosystem function responses to environmental stressors.

**PLENARY III**  
**THURSDAY, 7 JULY, 09:00**

## **Comparative ecophysiology, rarity and vulnerability to global change in aquatic insects**

David T. BILTON

Plymouth University, Plymouth, United Kingdom

Most species are rare, with relatively small geographical ranges, comparatively few organisms being naturally widespread. This pattern is commonly observed within individual clades, including many freshwater taxa. Individual genera are often dominated by narrow range endemics, but frequently include a handful of widespread species, which are ecologically and morphologically similar to their more restricted relatives. A variety of ecological and evolutionary processes may underlie such range size variation, one of the most popular hypotheses suggesting that widespread species have broader fundamental niches than narrow range taxa. Despite this common assumption, there have been very few empirical tests of such ideas. Variation in physiology can play a pivotal role in determining differences in niche breadth, predicting that widespread taxa will have broader ranges of physiological tolerance than restricted-range relatives, providing a potential means of testing niche theories of rarity.

My talk will summarize work over the last decade which has explored these ideas, mainly in water beetles, by studying closely related species which often differ dramatically in the extent of their geographical distributions. I argue that within a given habitat type physiological tolerance appears to be strongly associated with both range size and position, but that shifts between habitats may drive dramatic changes in distribution. I will go on to consider how such comparative studies may lead to a better understanding of organismal responses to global change, through both direct and indirect effects in nature.

**PLENARY IV**  
**FRIDAY, 8 JULY, 09:00**

## **Indirect impacts of climate warming in pelagic and benthic food webs**

Pavel KRATINA

Queen Mary University of London, UK

Rising temperatures, declining predator populations and eutrophication are three pervasive pressures affecting aquatic ecosystems. These processes may interact in a number of ways that are likely to vary seasonally, as temperature affects consumer-resource interactions and metabolic processes. We used a year-long experiment with 1200 L mesocosms to investigate the combined effects of warming, nutrient load and fish predation on freshwater communities. We observed strong top-down and bottom-up effects on plankton communities, and these effects varied over time. Enhancement of phytoplankton biomass with added nutrients is strongest when fish are present, primarily due to fish predation on large cladocerans. Warming enhances trophic cascades (particularly during winter) and reduces effects of eutrophication (particularly in summer). Although fish had significant cascading effects in both benthic and pelagic environments, the interactive effects of fish and temperature were substantially weaker along benthic and detrital pathways. This suggests that more reticulate benthic compartments may be more resistant to climate warming than simple pelagic food chains. We also show that fish predation suppresses the emergence of aquatic organisms into terrestrial ecosystems and reduces decomposition of terrestrial detritus in aquatic ecosystems. On the other hand, warming and nutrients both enhance cross-ecosystem fluxes, especially in systems without fish. Warming also increased net ecosystem production, while reducing the standing biomass of the dominant primary producers, indicating that warming speeds up energy movement throughout food webs. Our results show that the effects of simultaneous perturbations are often synergistic rather than independent. This indicates that the impacts of undergoing global warming will depend on local nutrient status or predator abundance.

# **Oral presentations**

**BEHAVIOURAL ECOLOGY**

OS-02, MONDAY, 5 JULY, 13:00–13:20

**Epigamic behavior of Golden-ringed Dragonfly  
(*Cordulegaster boltonii*)**

Martin ČERNÝ, Dominika DUBCOVÁ, Lenka HUPKOVÁ

Department of Ecology, Faculty of Science, Charles University in Prague, Prague, Czech Republic

Males of Golden-ringed dragonfly (*Cordulegaster boltonii*) are well known for their long "scanning" flights along a stream to seek females. In our study, we focused on several aspects of this peculiar behavior. Firstly, we were interested if males use polarized light as a navigation aid in already habituated "home" environment, secondly, if they use natural landmarks to demark their flight-range boundaries. In field experiments, we introduced artificial plastic "streams" to provide polarized (though functionally false) signal, as well as we placed non-transparent barriers across a stream to evaluate behavioral responses of individual males. Another set of experiments was done to assess how males recognize the females (typical movements, visible coloration, UV); for that we used both dead specimens and models to mimic ovipositing females. In all experiments, since most of the males were individually marked, we also try to evaluate if there are any individual differences among males in perceiving and learning their environment.

**BEHAVIOURAL ECOLOGY**

OS-02, MONDAY, 5 JULY, 13:40–14:00

**Polarization sensitivity in the water-surface-inhabiting  
springtail, *Podura aquatica***

Ádám EGRI<sup>1</sup>, Alexandra FARKAS<sup>1</sup>, Gábor HORVÁTH<sup>2</sup>, György KRISKA<sup>1,3</sup>

<sup>1</sup>Danube Research Institute, MTA Centre for Ecological Research, Budapest, Hungary

<sup>2</sup>Environmental Optics Laboratory, Department of Biological Physics, Physical Institute, Eötvös University, Budapest, Hungary

<sup>3</sup>Group for Methodology in Biology Teaching, Biological Institute, Eötvös University, Budapest, Hungary

The 6-ommatidium ventral eye of the water-surface-inhabiting springtail, *Podura aquatica*, has horizontal and vertical microvilli and perceives light from beneath and the front, while the 2-ommatidium dorsal eye possesses two upward-looking ommatidia with vertical microvilli. The ventral eye may serve water detection by its polarization sensitivity, even if the insect is resting with its head slightly tipped down on a field object. The polarization vision and polarotaxis in springtails (Collembola) have not been investigated. Hence, we performed behavioural choice experiments to study the polarization sensitivity and attraction to linearly polarized light in *P. aquatica*. We found that the strength of phototaxis in *P. aquatica* is dependent on the polarization characteristics of the light. The horizontally and vertically polarized light was the most and least attractive, respectively, while the unpolarized one elicited moderate attraction. We showed that horizontally polarized light attracted still more springtails than unpolarized, even if the polarized stimulus was ten times dimmer. Thus besides phototaxis, polarotaxis is also present in *P. aquatica* with the ability to measure or at least estimate the degree of polarization of light and this ability may serve the water detection visually. Our results indicate that the threshold  $d^*$  of polarization sensitivity in *P. aquatica* is between 25.5 and 10.1%.



**BEHAVIOURAL ECOLOGY**

OS-02, MONDAY, 5 JULY, 14:00–14:20

**Are diving beetles larks or owls? Pilot study on the diurnal rhythms of movement and air uptake behavior of *Cybister lateralimarginalis* De Geer, 1774**

Péter MAUCHART<sup>1</sup>, Bálint PERNECKER<sup>1</sup>, Estera GARAJOVÁ<sup>1</sup>, Eszter SEBESTYÉN<sup>1</sup>,  
Tomáš ONDÁŠ<sup>2</sup>, David S. BOUKAL<sup>3,4</sup>, Zoltán CSABAI<sup>1</sup>

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The accuracy of field studies of aquatic macroinvertebrate communities depends on our ability to reliably estimate their population sizes and distribution in space. However, we know little about the movement and activity patterns of benthic macroinvertebrates, which critically underlie this endeavor. This is particularly true for large and mobile species such as the diving beetles from the Dytiscinae subfamily. To fill this gap, we studied the movement and air uptake behavior of male *Cybister lateralimarginalis* in a pilot laboratory experiment focusing on their behavior near fishing traps baited with fresh chicken liver, which are now routinely used for the monitoring of large and mobile species. Observations were performed at 22°C (10D:14L photoperiod) in 2.4 m × 2.4 m square basins filled with 14 cm of aged tap water and provided with two bricks as resting places and a baited fishing trap. The experiments ran in September 2015. Individuals were acclimated in 600-L aquaria for several days before the experiment. We recorded their behaviour continuously with IR-sensitive cameras for 8 hours during the day and night conditions (n=5 in each treatment) and subsequently scored the videos for the following types of behaviour: resting, swimming (including swimming speed and direction), and breathing (timing and duration of air uptake). Our preliminary analyses identified highly contrasting behaviour between day and night: the movements were more random during day and more consistent at night, when the males were usually swimming around repeatedly using almost the same route. Moreover, average speed and distance covered were also significantly higher at night because the individuals spent more time swimming. Additionally, air uptake duration was significantly longer at night, while the intervals were similar at both day and night.

**BEHAVIOURAL ECOLOGY**

OS-02, MONDAY, 5 JULY, 13:20–13:40

**Disentangling the effects of life history and weather parameters on the emergence behaviour of Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979)**

Bálint PERNECKER, Réka BODA, Péter MAUCHART, Arnold MÓRA, Zoltán CSABAI

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The Balkan Goldenring is an endemic species to Central and South-eastern Europe which has been granted special conservation status. It is a Natura 2000 species of community interest and also a strictly protected dragonfly in Hungary. The populations of *C. heros* are under threat of extinction due to direct habitat destruction by humans and due to global climate change effects, e.g. reduced flows in headwater streams. Thus, it is particularly important to understand the effects of the weather and life history on the emergence of the species. Exuviae were collected along a 200 m long section of a second order stream in the Mecsek Mountains, SW Hungary in the same periods of five consecutive years (2011-2015), 3-6-day intervals between May and August. Larvae were collected from June 2011 to May 2012 in monthly intervals. For every larvae six different body dimensions were measured, from which head width and wing sheath length were used for determining larval stages. Based on the monthly numbers of individuals for each coexistent stage we described the population structure and the main features of its life cycle. Dataset of ten weather parameters were downloaded from the online database of the nearest meteorological station, which is located 12 km from the sampling site. In the summer of 2012, between August and October a severe drought occurred in the sampling site. The surface water almost completely disappeared, only in the largest pools retained some moisture. Our basic aims were to unravel the effects of weather parameters, droughts, and life history on the emergence behaviour of *C. heros*. Before the drought in 2012 we found 60 exuviae, while in 2013 only 13 exuviae were collected along the same section. This preliminary suggests that after a drought most of the final instar larvae disappear. However, emergence timing and trend does not differ from other years, only numbers of individuals. In 2014 the number of exuviae was similar to that in 2011 and 2012, while in 2015 we collected almost twice as many exuviae than the year before. Results from larval samplings shows that in the Mecsek larval development of *C. heros* lasts for 3 to 4 years. This means larvae emerged after the drought in 2014 and 2015 hatched in 2011 or 2012. This suggests smaller larvae can withstand prolonged drought.

**BIODIVERSITY**

OS-13, THURSDAY, 7 JULY, 15:20–15:40

**Clitellate assemblages of spring fens in Slovakia with a focus on a fen specialist *Trichodrilus strandi* (Lumbriculidae)**

Martina BÍLKOVÁ, Jana SCHENKOVÁ

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In the landscape of the Western Carpathian Mountains places of groundwater discharge can be found, forming rather small and isolated spring wetlands surrounded by woodlands, fields or pastures. Spring wetlands or spring fens are unique and nowadays very rare and threatened habitats with rich fauna and flora. We can recognize four types of fens depending on spring water chemistry: extremely mineral-rich fens with tufa formation, mineral-rich fens without the tufa, mineral-rich *Sphagnum* fens and mineral-poor *Sphagnum* fens. The gradient of mineral richness (poor-rich gradient) affects biota of these habitats (e. g. vegetation, molluscs, diatoms, dipteran larvae and also clitellates). Clitellates are a part of permanent fauna in spring fens that is often neglected. Our research revealed a surprisingly high diversity of clitellate fauna in fens typically containing aquatic species (e. g. family Naididae and Lumbriculidae) and also semiaquatic species (e. g. some species of the family Enchytraeidae). Sites with tufa incrustations are apparently not very favourable for these organisms. However, one lumbriculid species, *Trichodrilus strandi*, seems to be a specialist for this type of spring fens. Its populations reach high and stable abundances in comparison with other species in spring fens. Between 2006 and 2012 we studied clitellate assemblages (aquatic Oligochaeta and leeches) of 47 permanent treeless spring fens in the Slovak part of the Western Carpathian Mountains. In spring and autumn season altogether 188 samples of substrate with aquatic macroinvertebrates were collected at each site at two contrasting mesohabitats (flowing water and standing water). Over 20 000 individuals belonging to 48 taxa and eight families (“Oligochaeta”: Enchytraeidae, Haplotaxidae, Lumbricidae, Lumbriculidae, Naididae, Hirudinida: Erpobdellidae, Glossiphoniidae, Haemopidae) were found. One fifth of the total number of individuals belonged to the species *T. strandi* that was dominant in tufa-forming fens in most cases. Statistical analyses revealed one complex gradient of changes in substrate quality (amount of organic matter, total organic carbon in substrate) and mineral richness of water (pH, conductivity).

This research was supported by MUNI/A/1325/2015.

**BIODIVERSITY**

OS-13, THURSDAY, 7 JULY, 15:40–16:00

**Long-time emergence patterns of *Limnophora* species in specific karstic habitats: tufa barriers**

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The hunter fly genus *Limnophora* (Muscidae: Coenosiinae) is an important component of running water assemblages. These flies are predators as larvae and adults, mostly feeding on simuliids and other small aquatic insects. This study was conducted at two tufa barriers in Plitvice Lakes National Park (tufa barrier Labudovac and tufa barrier Kozjak-Milanovac) and at two tufa barriers in Krka National Park (tufa barrier Roški slap and tufa barrier Skradinski buk). At all sites adults were collected by using pyramid-type emergence traps which were emptied monthly, from February 2007 to December 2013 at Plitvice Lakes NP and from September 2013 to October 2014 at Krka NP. Over the 7-year study period at Plitvice Lakes tufa barriers a total of 193 specimens belonging to six species was collected, while during the 1-year study period at Krka tufa barriers a total of 848 specimens belonging to four species was collected. Densities of *Limnophora* specimens at the Krka NP sites were up to 15 times higher than at the Plitvice Lakes NP sites which could be attributed to higher levels of organic seston. The dominant species at the Plitvice Lakes sites were *Limnophora pulchriceps* and *Limnophora riparia*. At the Krka tufa barriers, the dominant species at the site Roški slap was *Limnophora croatica* and at the site Skradinski buk it was *Limnophora riparia*. The highest numbers of emerging specimens at all sites were present in summer months. At the Plitvice Lakes sites most species were univoltine or bivoltine, while at the Krka sites most species were multivoltine. Water temperature was the main factor influencing the timing of emergence and the duration of the flight period. The highest abundance of *Limnophora* specimens was recorded over moss substrate, and a significant positive correlation was revealed between the amount of emerging prey and the number of emerging specimens of *Limnophora*. These results give a new insight into microhabitat preferences and predator-prey relationships of *Limnophora* in these unique karstic habitats.

**BIODIVERSITY**

OS-11, THURSDAY, 7 JULY, 14:00–14:20

**Aquatic invertebrates of calcareous wetlands in post-mining landscape: a comparison with natural calcareous fens**

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Although many studies have dealt with vegetation and terrestrial fauna of post-industrial biotopes, comprehensive hydrobiological research on post-industrial wetlands is still rather rare. Due to specific bedrock chemistry of the Sokolov Coal Basin in the north-western Czech Republic, wetlands with calcium carbonate (tufa) precipitation, high conductivity and sulphate concentrations occur in this area. Within post-industrial wetlands, this combination of abiotic conditions is completely unique. Macroinvertebrate assemblages of nine wetlands in two spoil banks were studied in spring and autumn in 2014. In total, 159 taxa (mostly identified at the species level) of Mollusca, Clitellata, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Trichoptera, Coleoptera and Diptera were found. Diptera with 85 taxa was the most diverse group comprising many rare and protected taxa closely associated with specific conditions of the post-industrial calcareous wetlands. Taxa richness of Diptera assemblages was comparable with those of natural calcareous spring fens. Moreover, Diptera assemblages included a high number of spring fen specialists – e.g. *Oxycera pygmaea* (fam. Stratiomyidae), *Metriocnemus eurynotus* Gr. (fam. Chironomidae) and *Tonnoiriella pulchra* (fam. Psychodidae). Despite extreme chemical conditions, calcareous wetlands in post-mining landscape provide important refuges for a high number of aquatic invertebrates, including rare and specialized taxa. Calcareous wetlands of the Sokolov spoil banks can be thus considered as unique biotopes with similar taxa richness as highly threatened and quickly disappearing spring fens.

The study was supported by Sokolovská uhelná, a.s., the research project of the Czech Science Foundation P505/16-03881S and MUNI/A/0788/2013.

**BIODIVERSITY**

OS-11, THURSDAY, 7 JULY, 13:20–13:40

**Caddisflies (Trichoptera, Insecta) of Mediterranean tufa barriers: specific communities of unique habitats**

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Croatian Association of Freshwater Ecologist, Zagreb, Croatia

Tufa barriers are unique freshwater habitats due to their specific structure and formation process. They are characterized by specific communities of aquatic organisms. However, composition and structure of these are largely understudied, especially in the Mediterranean area. In this study, the caddisfly community at two tufa barriers (Roški slap and Skradinski buk) on the Krka River, Croatia, was investigated. Samples were collected monthly using emergence traps during the one-year period. A total of 27 species were collected. Emergence peaks were recorded in late spring/early summer (May/June) and emergence patterns of most species are in accordance with their typical emergence. However, duration of emergence periods of filter feeders was longer than their characteristic period, most likely due to favourable conditions at studied habitats. Caddisfly communities were at both barriers dominated by filter feeders and taxa typical for streams, however, some differences in the composition and structure of these two communities were observed. Higher diversity and equitability, and lower abundance of caddisflies were recorded at the Roški slap barrier than at the Skradinski buk barrier. Passive filter feeders (*Hydropsyche* sp.) were particularly abundant at the Skradinski buk barrier, due to availability of suspended organic matter and prey from the upstream Visovac Lake. Observed differences in caddisfly communities are mainly the consequence of the position of two tufa barriers along the river course, due to different ecology of species and availability of food resources. On the other hand, no considerable differences between communities at various microhabitats at each site were observed. Overall, this study represents an important contribution to the knowledge of ecology of aquatic insect communities at tufa barriers in Mediterranean rivers.

**BIODIVERSITY**

OS-11, THURSDAY, 7 JULY, 13:00–13:20

**Quantifying the variation of fecundity in mayflies  
(Insecta: Ephemeroptera)**

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Fecundity of mayflies (Insecta: Ephemeroptera) is one of the highest reported among insects, apart from social Hymenopterans. At the same time, the amount of the eggs produced per female considerably differ in individual species, ranging from 100 to 12 000. Mayflies are semelparous and in most species, adult fecundity can be directly estimated by dissecting mature larvae. Mayflies also exhibit highly diversified life histories and morphologies, which makes them ideal to test classical concepts from life history theory. We dissected, counted and measured eggs in last-instar larvae of 50 species occurring in the Czech Republic, covering all main taxonomic and ecological mayfly groups from the region. This allowed us to estimate relative reproductive investment (ratio between the estimated total egg volume and estimated body size) and absolute fecundity. We used generalized linear models with and without phylogenetic constraints to determine which traits have the highest impact on the fecundity of mayflies. While reproductive investment increased with body size as expected, other characteristics such as the relative reproductive investment and egg size varied considerably among species, suggesting that multiple solutions to the growth-reproduction and the offspring size-number trade-offs have evolved in mayflies.

**BIODIVERSITY**

OS-13, THURSDAY, 7 JULY, 15:00–15:20

**Large branchiopods (Branchiopoda: Anostraca, Notostraca, Spinicaudata) as pilgrims in time and space in Central Europe**

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Fairy shrimps (Anostraca), tadpole shrimps (Notostraca) and clam shrimps (Spinicaudata, Laevicaudata) belong to most endangered invertebrates in Europe, which is partly due to their strong preference of threatened habitats of temporal waters. On the other hand, their adaptations to these unstable habitats are also very useful for their long-term survival within the European landscape. Especially their dispersal ability enables reaching new suitable sites in time and space. In the Czech Republic, altogether 12 species of large branchiopods were recorded during last two centuries. Regarding summer species preferring open temporal pools, greater expansion of them was in Central Europe evidently connected with the expansion of agriculture. Because of degradation of wetlands and river alluvia especially during the 19th and 20th century, shift in occurrence from habitats of alluvial ephemeral pools to arable soil pools and into military areas, which represent recently the core of their occurrence, was detected. This shift can be studied by comparison of historical and recent known distribution of large branchiopods in Bohemia and Moravia. Birds, water and surprisingly also heavy army machinery were probably the most important mechanisms of their spreading. Although large branchiopods are protected by law and classified as threatened in the red lists, their conservation in wetlands in agricultural landscapes and military areas is quite problematic, since it is usually not possible to protect their localities by site protection and since they require very specific management. For these reasons, further research of their biology and ecology, and development of suitable management practices is needed.



**BIODIVERSITY**

OS-11, THURSDAY, 7 JULY, 13:40–14:00

**Diversity of caddisflies (Trichoptera) in springbrooks of the Western Carpathian spring fens: Are their assemblages distinct from neighbouring streams?**

Jana ZAJACOVÁ, Lenka HUBÁČKOVÁ, Jindřiška BOJKOVÁ

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Spring fens are habitats characterised by specific abiotic conditions, such as relatively constant temperature and flow regime, low water depth and predominantly organic substrate. Owing to their island distribution in the landscape, springs and their communities are considered to be isolated from the surrounding habitats. One of the most diversified and abundant groups of spring aquatic macroinvertebrates are caddisflies (Trichoptera) which include many specialists adapted to specific conditions of these habitats. The main aim of this study is a comparison of caddisfly assemblages inhabiting springbrooks that drain spring fens in the Western Carpathians, with assemblages of the neighbouring streams. The Western Carpathian spring fens are relict biotopes with valuable fauna and flora, scattered sparsely in the eastern part of the Czech Republic and the northern part of Slovakia. Larvae of caddisflies were sampled at 25 pairs of springbrooks and neighbouring streams, three mesohabitats (riffle, pool, moss) were investigated separately in the streams. More heterogeneous mesohabitat structure of streams resulted in significantly higher (altogether 63 species) species richness in comparison with the springbrooks (40 species). When comparing stream mesohabitats, riffles are preferred by more species than pools. Moss patches were inhabited mostly by juveniles of many different species. Springbrooks and streams shared 37% of caddisfly species which included lotic taxa dominating in the studied streams and less abundant in the springbrooks (e.g. *Sericostoma* sp., *Rhyacophila tristis*, *Chaetopteryx fusca/polonica*), and spring specialists (crenobiontic and crenophilous species) frequent in springbrooks, but rare in the streams (e.g. *Beraea maurus*, *B. pullata*, *Ernodes* sp., *Crunoecia irrorata*, *Agapetus fuscipes*). About 16% of species found exclusively in the springbrooks comprised some rare crenobiontic species (e.g. *Synagapetus dubitans*, *Micropterna lateralis*) and all lentic species (e.g. *Limnephilus ignavus*, *Oligostomis reticulata*). The remaining 47% of caddisflies restricted in the streams can be characterized as lotic species typical for rhithral or potamal streams (e.g. *Allogamus auricollis*, *Halesus* sp., *Hydropsyche saxonica*, *Philopotamus montanus*, *Rhyacophila nubila*). The comparison of springbrooks and stream mesohabitats using non-metric multidimensional scaling (NMDS) showed that caddisfly assemblages of springbrooks are similar to those of the pools, likely due to shared lotic species preferring slow-flowing water and organic substrate.

**BIOGEOGRAPHY**

OS-01, MONDAY, 5 JULY, 11:30–11:50

**Cryptic refugia and postglacial colonisation in the northern Carpathians. Case study of *Gammarus balcanicus* (Crustacea, Amphipoda)**

Tomasz MAMOS, Krzysztof JAŹDŹEWSKI, Michał GRABOWSKI

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Pleistocene glaciations provide a background for the composition and distribution of European fauna and flora. Existence of refugia in South European peninsulas and process of postglacial recolonisation are very well documented. However, biodiversity sheltered not only in these regions. There is an increasing number of studies revealing presence of the, so called, cryptic refugia in central and northern Europe, areas that were predominantly covered by continental ice-sheet during glaciations. Carpathians, region known as the biodiversity hotspot, may be an example. The southern and south-western parts of the Carpathian Arch hold particularly high biodiversity and endemism, especially on molecular level, that evidences existence of glacial refugia. On the other hand, their eastern and north-western region is still understudied, particularly in terms of molecular diversity. The aim of our study was to reveal potential cryptic refugia in the northern Carpathians and to track patterns of postglacial colonisation based on mtDNA COI marker. Our model organism was a strictly aquatic crustacean *Gammarus balcanicus*, widely distributed in northern Carpathians. This amphipod is known to hold substantial cryptic diversity, what makes it a good model for biogeographical studies. The material was collected from 21 localities in Hungary, Slovakia and Poland. The barcoding marker (COI) was amplified from 144 specimens. All the sequences with metadata were uploaded to BOLD. Several methods of molecular species delimitation (ABGD, GMYC, bPTP) were applied to the obtained dataset. Phylogeny was reconstructed using Maximum Likelihood and Bayesian methods. Additionally, Bayesian tree was calibrated using molecular clock. Historical changes in demography of the studied populations were analysed using Bayesian Skyline Plot and Mismatch Distribution. Molecular species delimitation methods revealed presence of four molecular species within the analysed pool of COI sequences. One of them, both geographically and morphologically, fits the previously described subspecies *G. balcanicus tatrensis* S. Karaman, 1931. Therefore we decided to re-describe this taxon and rise it to a species level. Other three revealed species remain cryptic but molecular diagnostic characters were assigned to each of them. The endemism of these species and age of their divergence, much older than Pleistocene, suggest that they survived glaciations in refugia within northern Carpathians. Analyses of demography clearly show that their populations declined in Pleistocene and experienced recent expansion. In result two species colonised most of the Eastern Carpathians while the remaining two did not extended their ranges. The existence of refugia in northern Carpathians was so far reported only once, based on fossilised land molluscs. The current study is the first to reveal multiple glacial refugia for freshwater organisms and patterns of postglacial colonisation in this region.

**BIOGEOGRAPHY**

OS-01, MONDAY, 5 JULY, 11:10–11:30

**Double origin of Central European fairy shrimp  
*Eubranchipus grubii***

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Fairy shrimp *Eubranchipus grubii* lives in a specific habitat of temporary spring pools. It is distributed in northern parts of Central and Eastern Europe, almost entirely in lowland floodplain pools filled with groundwater in spring. Cold temporary pools resembling the present day vernal pools likely existed in Central Europe throughout the whole Pleistocene including ice ages. Current distribution and ecological requirements of *E. grubii* and our understanding of Pleistocene environment imply that *E. grubii* have no southern glacial refugia. Genetic relationships of *E. grubii* populations were studied by using two mitochondrial markers (16S and CO1). Study area was restricted to Czech Republic and included three main European drainages of Black, Baltic and North Sea. Both molecular markers showed the same major division of populations: the first lineage inhabits Odra watershed, the second lineage inhabits Elbe and Morava watersheds. CO1 provided further insight into the second lineage. According to CO1, individuals were divided into three haplotype lineages (A, B, and C), with partially disjunct geographic distribution. Individuals of lineage A origin mostly from Elbe and Morava river catchment. Lineage B comes mostly from populations of Thaya river catchment and area of confluence of Thaya and Morava rivers. Lineage C is most divergent, individuals mostly origin from populations sampled in Odra river catchment. We conclude that populations from Odra lineage are not of local origin. Odra catchment is the only part of sampled area which has been glaciated during LGM, and possible glacial refugium of Odra lineage might be in East European steppes west of Ural. Except for typical floodplain pools, several populations of *E. grubii* were found in pools close to the floodplains, but at higher elevations. It is generally believed that major dispersion of individuals occurs among floodplain pools and that dispersal to other localities is unlikely, which is supported by general distribution of *E. grubii*. However, animal or human vectors must play some role in dispersal to wider range of habitats and/or to larger distances, and when inoculum finds favorable conditions, population might be established. And indeed, individuals from these localities have often rare haplotypes genetically distant from geographically closest floodplain pools and in several cases belong to geographically different haplotype group. Waterfowl or human transport are the most likely explanation of such dispersal.

**BIOGEOGRAPHY**

OS-01, MONDAY, 5 JULY, 10:30–10:50

**The Balkan grazer group (Drusinae, Limnephilidae, Trichoptera): phylogeny, morphology and distribution of enigmatic endemics**

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Miklós BÁLINT<sup>4</sup>, Johann WARINGER<sup>1</sup>, Steffen PAULS<sup>4</sup>, Wolfram GRAF<sup>5</sup>

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The caddisfly subfamily Drusinae comprises roughly 100 cold-adapted species that inhabit Eurasian mountain ranges. Extant distribution patterns suggest an evolutionary history shaped by orogenic and climatic oscillations. In addition, the group exhibits an unusually complex larval feeding ecology and comprises three different larval feeding guilds representing monophyletic evolutionary lineages: scraping grazers (characterized by spoon-shaped mandibles), omnivorous shredders (characterized by mandibles with terminal teeth), and filtering carnivores (characterized by mandibles with terminal teeth and specialized filtering setae on legs and the first abdominal sternite). Further, highly complex patterns of distribution, ecology and morphology characterize mountain ranges on the Balkan Peninsula as important regional diversification centres of Drusinae. We pursue an integrative approach amalgamating multi-locus phylogenetics, comparative morphological studies and distribution data in order to define the monophyletic “Balkan grazer Group” comprising Balkan Peninsula endemics with grazing larval ecology. Aiming to delineate this group, but also to infer species-level relationships within the group, we reconstruct the phylogeny based on 3805 bp of genetic sequence data from six molecular markers (two regions of mtCOI, mtLSU, 28S, nuCAD, nuWG) using different methods. Additionally, we assess morphological characteristics of larvae and adults, and identify potential synapomorphies. The monophyletic “Balkan grazer group” consists of several clades with closely related micro-endemic species inhabiting adjacent areas. Interestingly, phylogenetic relationships are in accordance with small-scale geographic distribution of the species, enabling postulation of some major geographic barriers. We further discuss phylogeographic patterns of Drusinae grazer species in the Balkans with particular emphasis on potential drivers of speciation. Overall, our findings illuminate complexities of diversification and speciation of endemic aquatic insects in a major European biodiversity hotspot.

**BIOGEOGRAPHY**

OS-01, MONDAY, 5 JULY, 10:50–11:10

**Challenges in research and conservation of mayflies  
(Ephemeroptera) in the Middle East**

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The Middle-Eastern mayfly fauna (Ephemeroptera) currently consists of 193 documented species in 15 families. During the first half of the 20th century research on the order has been mostly limited to Turkey, Syria and Lebanon, with only sporadic published records from other countries. In recent years, ongoing collaborations between local and European scientists expand our knowledge on the Ephemeroptera of the region, including the discovery of numerous new taxa and emerging insights about zoogeographical patterns and ecological requirements in different groups. The region's fauna comprises Palearctic, Oriental, and Paleotropical elements, and is characterized by high endemism rates. Coupled with the fact that many taxa reach the edge of their distribution ranges in the Middle East, these attributes highlight the importance of the region as a center of mayfly diversity. Overlap among faunas of different Middle-Eastern countries is relatively small (maximum Jaccard's similarity coefficient ~27%), but is expected to increase as more taxa are identified and knowledge on their distribution ranges becomes available. The contribution of collaborative studies is demonstrated by an ongoing research on the Israeli fauna, which is expected to enrich by 150% the number of species known from this country (currently at 22), mainly thanks to species of the family Baetidae, most of which are presumably undescribed. Ecological information is severely poor comparing to European fauna, and is crucial for bioindexing Middle-Eastern species which are subject to different anthropogenic impacts than in temperate regions. Many Middle-Eastern species are threatened by habitat destruction as a result of water overuse and pollution, hence substantiating the information on mayfly taxonomy and ecology may contribute to conservation efforts of this group.

**COMMUNITIES**

OS-15, FRIDAY, 8 JULY, 12:20–12:40

**Relative roles of environmental and spatial factors in determining macroinvertebrate metacommunity structure in riverine systems**

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A metacommunity is a set of local communities connected by the dispersal of a number of potentially interacting species. In riverine networks the local community can be shaped by the different combinations of environmental and spatial processes controlled by dispersal. The strength of these processes may vary depending on species traits (e.g., dispersal mode) or the characteristics of the regions studied (e.g., spatial extent, environmental heterogeneity). Previous studies suggested that in dispersal limited headwaters, which are isolated, the sorting effects of environmental conditions are the most important driving mechanisms (species sorting paradigm). In contrast, in the mainstem river sections, where the dispersal is unlimited, thus environmental factors are less important and spatial effects prevail (mass effects paradigm). There is lack of knowledge related to larger rivers, thus new empirical studies considering stream networks would increase our understanding of metacommunity organisation. The objective of our study was to investigate the role of the two metacommunity paradigms on groups of aquatic macroinvertebrate organisms with different dispersal abilities in case of both streams and larger rivers. The sampling was carried out during the summer of 2013 and the spring of 2014 from both types of running waters in the Pannon Ecoregion along two large river basins in Hungary. At each site, eight water chemistry, 13 in-stream and four catchment variables were measured. To determine dispersal ability groups the AqPa (aquatic adults and passive overland dispersal), TePa (terrestrial winged adults with mainly passive dispersal mode), TeAc (terrestrial winged adults with mainly active dispersal mode) proxies were used. PCA analyses were used to compress respectively the environmental variables into PCA axes. We used partial redundancy analysis and Moran's eigenvector maps based on overland and watercourse distances to study the relative importance of environmental control and spatial structuring. Our study emphasized that (1) environmental control is prevailing in stream metacommunities, (2) dispersal mode may have an important effect on metacommunity structuring, and (3) the environmental and spatial factors which determine the community structure have temporal variability. Our study also highlighted that the deconstruction of the entire assemblages by species dispersal trait and landscape classifications are useful tools for a better understanding of the structuring of metacommunities.



COMMUNITIES

OS-15, FRIDAY, 8 JULY, 12:00–12:20

**The influence of abiotic environmental factors on the regional distribution of larval net-spinning caddisfly species (Trichoptera: Hydropsychidae) in Northern Hungary and in the Northern Great Plain**

Márk FICSÓR

Government Office of Borsod-Abaúj-Zemplén County, Department for Environmental Protection and Nature Conservation, Laboratory for Environmental Protection, Miskolc, Hungary

Understanding the effects of environmental factors on the distribution of freshwater invertebrates is a major issue in aquatic ecology. Many studies are aimed to explain the influence of various impacts on the distribution of different species or species assemblages on regional, local or microhabitat scale. In this study the influence of three groups of abiotic environmental variables on the regional distribution of larval net-spinning caddisflies were investigated. Selected physical/hydrochemical, local and regional variables were tested to explain the variance in the abundance data of nine *Hydropsyche* species as a result of 206 samplings according to the AQEM method at 87 sites in Northern Hungary and in the Northern Great plain between 2009 and 2014. Standard statistical and ordination methods were applied. Stepwise regression (forward selection) revealed seven physical and hydrochemical variables (water temperature, pH level, conductivity, chemical oxygen demand, diluted oxygen, ammoniacal-nitrogen, orthophosphate concentration), four local (megalithal, macrolithal, microlithal and emergent macrophytes substrate types) and five regional variables (arable land, permanent crops, pastures, heterogeneous agricultural areas and inland waters as land cover types) to have significant impact on the abundances of species. Variation partitioning showed that "pure" effects of regional (40.93%), physical/hydrochemical (20.1%) and local variables (19.72%) explain the majority of the total explained inertia (28.9%). Results of Redundancy Analysis (RDA) shows three species, *Hydropsyche fulvipes*, *H. instabilis* and *H. saxonica* to prefer well oxygenated waters with larger substrate particle size while *H. contubernalis* and *H. modesta* to be found at lower sections of the river continuum with finer substrates and followed by more anthropogenically affected areas. *Hydropsyche angustipennis* seems to be the most tolerant of higher levels of chemical oxygen demand, orthophosphate concentration, conductivity and the presence of agricultural areas. *Hydropsyche incognita* and *H. pellucidula* represent somewhat similar preferences with the latter seemingly tolerate lower concentration of phosphate and minerals and prefer microlithal substrates. Generalized Additive (GAM) and Generalized Linear Modelling (GLM) revealed further relations of the species and the environmental variables investigated. The overall results support the idea of hydropsychid species to represent a kind of sequential distribution (zonation) along the stream-river continuum mostly influenced by complex effects of physicochemical, local and regional factors on this scale and underpin their importance as bio-indicators as well.

**COMMUNITIES**

OS-07, TUESDAY, 5 JULY, 15:00–15:20

**Ephemeroptera, Plecoptera and Trichoptera assemblages on the interplay between natural and human-induced factors in different types of karst river ecosystems**

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The structural and functional attributes of Ephemeroptera, Plecoptera and Trichoptera (EPT) assemblages were studied to analyse the ecological differences among rivers of the bioregion Subdinaric hills and plains, ecologically being part of the ecoregion Dinaric western Balkan. Although the natural (typological) variation among rivers is restricted, the variability of abiotic features and consequently biological assemblages is still present. River site grouping was performed with regard to the typological factors meandering and karst spring influence being significant for invertebrate assemblages and two river groups, i.e. Karst and Non-Karst Rivers, were defined. Since the good ecological status meets the management objectives of the Water Framework Directive, river sites were classified as degraded or non-degraded, based on hydromorphological alteration and organic pollution status. Non-metric multidimensional scaling (nMDS) and a distance-based permutational analysis of variance (PERMANOVA) were used to test classification strength of typological and human-induced factors. Both groups of factors as well as their interaction are shaping EPT assemblages in rivers of targeted bioregion. Mann-Whitney U tests revealed significant differences among Karst and Non-Karst Rivers mostly for functional EPT assemblages attributes, whereas among degraded and non-degraded for structural and functional ones. In Karst Rivers, structural and functional aspects of EPT assemblages were less indicative of human-induced changes compared to Non-karst Rivers. The Indicator Value Analysis (IndVal) revealed several indicator EPT taxa for Karst and Non-Karst Rivers. In degraded rivers of the bioregion, lower number of indicator EPT taxa than in non-degraded rivers was found. Moreover, the number of indicator EPT taxa in degraded Karst was higher than in degraded Non-karst Rivers. These findings provide us evidence that significant differences in ecological conditions between Karst and Non-karst Rivers exist and therefore we emphasize the river-type grouping approach of utmost importance for best-practice river management.



**COMMUNITIES**

OS-07, TUESDAY, 5 JULY, 15:40–16:00

**Functional composition of macroinvertebrate communities in two sub-basins of the Tisza River**

Eszter Á. KRASZNAI<sup>1,2</sup>, Pál BODA<sup>2</sup>, András CSERCSA<sup>1</sup>, Csaba DEÁK<sup>3</sup>,  
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Through the past decades, the ecological status of most of the running waters in Hungary deteriorated more or less. Due to the activities of light and heavy industry and the insufficient methods used in wastewater treatment, the Sajó and Hernád Rivers, two of the most important tributaries of the Tisza River (second largest river of the country), became ones of the most polluted rivers of Hungary and Slovakia since the 1950's. These unfavourable conditions fortunately reversed in the mid-1990s, since when the ecological status of these rivers increased considerably. We compared the role of environmental, habitat and spatial variables on the species composition by variation partitioning. Apart of species composition we also test whether the functional trait composition reflects in a same way to spatial and environmental variation. We compared the sets of functional structures based on catchments and by stream order types. Functional structure was assessed using biological traits analysis, namely Rao's Q of functional diversity. We also investigated by co-correspondence analysis, which biotic components, diatoms or macrophytes determine both taxonomic characteristics and biological traits of benthic macroinvertebrate assemblages.

**COMMUNITIES**

OS-15, FRIDAY, 8 JULY, 12:40–13:00

**Macroinvertebrate colonization and organic matter transport  
in moss mats at tufa barriers**

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University of Zagreb, Faculty of Science, Department of Biology, Division of Zoology  
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Moss mats develop extensively on the tufa barriers that form waterfalls. Due to moss architecture, these habitats support exceptional biodiversity and abundance of macroinvertebrates. Additionally, moss mats are especially important in the cycling of organic matter and energy in karst aquatic ecosystems as retentive mechanisms for particulate organic matter. In this study we determined the dynamics and migration patterns of macroinvertebrates and patterns of organic matter transport through moss mats of tufa barriers. We conducted the study at tufa barriers of Plitvice Lakes. We have monitored macroinvertebrate migrations using cuboid traps filled with evacuated tufa blocks covered with moss. Trap sides were covered with nets of either coarse mesh (open sides) or fine mesh (closed sides). Therefore, traps allowed entrance either selectively or from all sides. Control traps were exclusively covered with fine mesh nets. We found that some physico-chemical parameters of water were significantly different within the moss mats compared to surface water. Stoneflies, caddisflies and non-biting midges were the most active migrants with clear preference toward the direction of migratory behavior. Beetles and other dipterans exhibited no migration patterns. The transport of organic matter particles was dependent on their size. Fine and ultrafine particles were predominantly transported actively by macroinvertebrates.

COMMUNITIES

OS-07, TUESDAY, 5 JULY, 16:00–16:20

**Determinants of community structure of large aquatic insects (Heteroptera and Coleoptera: Dytiscidae, Hydrophilidae) in space and time: a pond case study**

Tomáš ONDÁŠ<sup>1</sup>, Vojtěch KOLÁŘ<sup>2,3</sup>, Jan KLEČKA<sup>3</sup>, Václav KŘIVAN<sup>4</sup>,  
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We carried out a two-year monitoring of large aquatic insects in the Vizír pond National Nature Reserve in Southern Bohemia. The locality hosts the largest known population of the endangered diving beetle *Graphoderus bilineatus* in the Czech Republic. We deployed 25 activity traps at approximately monthly intervals from April to October in 2009 and 2010. This long-term study was supplemented by two capture-recapture events using 143 traps in September 2009 and May 2010. We captured more than 2800 individuals during the long-term study and almost 1000 individuals during the capture-recapture events. Dominant species included *Acilius canaliculatus*, *Graphoderus cinereus*, *Dytiscus marginalis* and *Dytiscus circumcinctus*. Population dynamics of several species differed substantially between both years, highlighting the need for long-term monitoring in order to understand the main patterns in community dynamics. The abundance of *G. bilineatus* was highest in spring (April-May, overwintered adults) and late summer (August-September, new generation): these periods should be used for the monitoring of this species in Central European conditions. Abundance of most species was highest in shallow water near the shore, habitat associations (i.e. preferences for open water or certain type of submerged vegetation) differed partly between species, suggesting possibilities of species-specific habitat management. In particular, the local population of *Graphoderus bilineatus* preferred sedge stands and relatively open water, which contrasts with known preferences of western and southern European populations.

**COMMUNITIES**

OS-15, FRIDAY, 8 JULY, 11:40–12:00

**The effect of predation risk and habitat complexity on  
community assembly in small standing waters**

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Top-down effects of predation risk and bottom-up effects of habitat complexity influence community assembly in small standing waters, but experiments that would explore their impact simultaneously are largely lacking. We ran three colonization experiments, each lasting 4–6 weeks, between 2011 and 2015 to fill this gap. All experiments consisted of an array of 45 L mesocosms that were inoculated with phyto- and zooplankton but otherwise were free from colonizing aquatic macroinvertebrates. We used caged and/or free-ranging dragonfly larvae (*Aeshna* sp. or *Anax imperator*) or invasive crayfish (*Orconectes limosus*) to manipulate predation risk and plastic models of submerged plants to increase habitat complexity in a fully crossed factorial design (i.e., 2–3 levels of predation risk and two levels of habitat complexity). We destructively sampled the entire volume of each mesocosm and identified, counted and in one study also individually measured the colonizers. We utilized allometric relationships between length and dry mass of different taxa to compare their total biomass. Mesocosms with added artificial plants typically had more herbivores (in particular the mayfly *Cloeon dipterum*), while the abundance of detritivores and predators were usually similar across treatments. Preliminary analyses of our results show that the bottom-up effect of habitat complexity always prevailed over the top-down control by predators for most taxa. We hypothesize that the negative impacts of predation risk were compensated by nutrient regeneration facilitated by the predator's metabolism in those cases. We found no effect on abundance but differences in biomasses in some groups, suggesting differential growth, timing of colonization or size-dependent mortality across treatments. Last but not least, we did not find any significant non-additive effects of habitat complexity and predation risk in any experiment. This suggests that conclusions on community assembly in complex habitats with predation risk can be drawn from studies examining these two factors separately.

**COMMUNITIES**

OS-07, TUESDAY, 5 JULY, 15:20–15:40

**Longitudinal and temporal changes in functional feeding groups of aquatic macroinvertebrates along a given stream**

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<sup>2</sup>Fertő-Hanság National Park, Sarród, Hungary

Longitudinal and temporal changes in functional feeding groups of benthic macroinvertebrates communities were investigated in 19 km long Rák stream (Sopron, West-Hungary) in 2012. The samples were taken at six sites along the brook and these were taken seasonally (spring, summer and autumn). The upper part of the stream is rather undisturbed, natural while the lower section of the brook is heavily affected by urbanization. Richness, benthic densities and variety of functional feeding group were higher at the upper part of the stream (covered by HAZ, BAN, HAJNAL sampling points) than in the lower part of the brook (FASOR, GYORI, TESCO). Abundance-based estimates of functional feeding group composition were dominated by detritus feeders and grazers in urbanized area, while shredders, active filter-feeders and grazers were represented in high number in upstream. Regarding the temporal change of functional feeding groups the number of predators and detritus feeders decreased over the year, and number of active filter-feeders and shredders were the highest in summer at upstream. The abundance of detritus feeders decreased from spring to autumn, but the number of grazers and shredders increased over the year in the urbanized part of the brook. It was found that in certain functional feeding groups there were different species utilizing the upper and lower sections even if belong to the same genus. There was a good example in the case of the genus *Gammarus*. In other occasions serious differences in abundance were recognized of certain species, e.g. *Ephemera danica*, *Odontocerum albicorne*. In general, the diversity of the more sensitive species (represented by the EPT index) was higher at the upper courses in all sampled periods.

**CONSERVATION & MANAGEMENT**

OS-08, TUESDAY, 5 JULY, 15:00–15:20

**Downtown versus suburban residents: surrounding habitats helps to maintain macroinvertebrate diversity of a shallow marsh system**

Pál BODA<sup>1</sup>, Arnold MÓRA<sup>2</sup>, Gábor VÁRBÍRÓ<sup>1</sup>, Zoltán CSABAI<sup>2</sup>

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<sup>2</sup>Department of Hydrobiology, Faculty of Sciences, University of Pécs, Pécs, Hungary

The composition, structure, habits and dispersal ability of the inhabitant communities in the downtown and suburbs can be different in the cities as well as in freshwater ecosystems. The large and patchy core parts of marsh ecosystems are generally surrounded by smaller but seemingly also important related habitats. We hypothesized that besides of the Core habitats the related Transitional and Satellite habitats also have unique communities with specific taxonomical and functional features. In 2012, we made thorough faunistical samplings in spring, summer and autumn at a total of 42 sampling sites along these habitats of a complex marsh system. The highest species richness was estimated in Transitional habitats, Satellite habitats had clearly unique species composition, while Core habitats maintained a moderately rich number of species but stable community with high taxonomical distinctness. The metacommunity of the whole marsh was nearly random with a substantial equilibrium between beta-diversity features: replacement and dissimilarity. Trait based analyses showed that proportion of taxa with short larval development (<1 year, significant) and long life taxa (≥1 generations per year) were lower in the Satellite habitats. Proportions of passive dispersers were significantly higher in the Core habitats, while there were no significant differences among the areas in the case of the active dispersers. Our results supports that the directly connected and isolated reservoirs together with the large core water body maintain the highest diversity, much higher than separately, i.e. the whole is more than the sum of its parts. Here we provide evidence on the importance of non-core habitat patches and provide scientific means for the best configuration of preserves in the case of a shallow marsh system. All these habitats together need to be considered as one meaningful ecological entity and Satellite and Transitional habitats should be considered as an integral part of the landscape restoration schemes.

**CONSERVATION & MANAGEMENT**

OS-08, TUESDAY, 5 JULY, 15:40–16:00

**Mortality during emergence in *Gomphus flavipes* and  
*G. vulgatissimus* (Odonata: Gomphidae): effects of emergence  
strategy and environmental conditions**

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<sup>2</sup>University of Pécs, Faculty of Sciences, Department of Hydrobiology, Pécs, Hungary

The emergence of dragonflies is a critical period, during which heavy mortality can occur. Although there are many studies dealing with the mortality at emergence in dragonflies, little is known about how environmental factors and the strategy of emergence shape the losses in the emerging population. We studied the mortality at emergence in two congeneric *Gomphus* species (Odonata: Gomphidae) that are known to differ in their emergence strategy, with the aims to find out (1) whether total ratio and factors of mortality depend on the strategy of emergence, and (2) how different environmental (meteorological and hydrological) conditions during emergence affect mortality rates in these two species. The study was carried out along the Danube in Hungary, at the branches surrounding the island Szentendrei-sziget. Systematic collections of exuviae, dead and damaged specimens as well as dragonfly wings left behind by birds were made daily during the whole emergence period in 2011. In the case of all exuviae found in situ, the distance travelled from the water line to the emergence site was recorded. The total mortality at emergence was higher in *G. flavipes* emerging in larger numbers close to the water line in a narrow stretch, while mortality was lower in *G. vulgatissimus* emerging in small numbers far from the water line scattered in a larger area. Higher mortality in dense population was mainly attributed to higher predation pressure; on the other hand, natural losses were exacerbated by mortality due to artificial waves induced by various watercrafts. Our results suggest that unfavourable weather conditions (e.g. rainfall, strong wind, low temperature) decrease the number of emerging specimens and increase the rate of mortality at the same time.

**CONSERVATION & MANAGEMENT**

OS-04, TUESDAY, 5 JULY, 10:50–11:10

**Microplastics – silent killer of freshwater communities**

Tadeusz FLEITUCH

Institute of Nature Conservation Polish Academy of Sciences, Krakow, Poland

Plastics bring many societal benefits but the increased use of synthetic materials is of emerging concern. Plastic contamination is currently a problem in marine systems where it has spread globally to even the most remote habitats. Plastic fragments in smaller size scales, microplastics (particles <5 mm), have reached high densities in water column and sediments, and are interacting with organisms and the environment in a variety of ways. Data from freshwater ecosystems is scarce. So far, only few studies provide evidence for the presence of microplastic litter in rivers and lakes. Microplastics are ingested by water invertebrates, but data on litter uptake by freshwater organisms is very limited. Given that the study of microplastics in freshwater ecosystems has only arisen in the last few years, we are still limited in our understanding of 1) their presence and distribution in the environment; 2) their transport pathways and factors that affect distributions; 3) methods for their accurate detection and quantification; 4) the extent and relevance of their impacts on aquatic animals. Extensive collaboration between environmental scientists representing diverse disciplines (chemistry, hydrology, ecotoxicology) and environmental agencies (water management, chemical and ecological monitoring) is essential for the future investigations. Moreover, we do not know if and how microplastics may affect human health. This is concerning because human populations have a high dependency on freshwaters for drinking water and for food resources.



**CONSERVATION & MANAGEMENT**

OS-04, TUESDAY, 5 JULY, 11:30–11:50

**The ESSESMENT project: setting the scene for the ecological management of a multiple-stressed region**

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<sup>3</sup>Y. Allon Kinneret Limnological Laboratory, Israel Oceanographic and Limnological Research, Haifa, Israel

Within the range of Mediterranean ecosystems, Israel represents an extreme case of a water-stressed region that results from its semi-arid climate, geophysical topography, dense population, and complex politic situation. Over the last century, ensuing agricultural and urban development had led to augmented human demand for land and freshwater resources. Many perennially flowing streams became intermittent, temporary streams dried out, while naturally dry channels (Wadies) were transformed into conduits of waste waters. For the past three decades, the Israel Ministry of Environmental Protection (IMEP) is striving to restore functionality and ecological integrity. Although in some cases these efforts are fruitful, the change in ecological state has been rarely tested. As Israel is a non-EU country it is not obliged to implement the Water Framework Directive. However, there is a strong agreement among Israeli decision makers on the need to develop a comparable framework for biologically monitoring the ecological state of streams and rivers as a management tool. The ESSESMENT project (“Ecological Status, Ecosystem Services and Management of the Lake Kinneret Catchment”: 2015-2017) is a first and important step towards this goal. The aim of the project (supported by the German-Israeli Foundation for Scientific Research and Development and by the IMEP) is to develop a national river basin biomonitoring programme, using Lake Kinneret (Sea of Galilee) as a model catchment. In this talk, I will present the general setting of the project and discuss the main achievements of the first year, which focused on five successive steps: 1) development of stream typology, 2) identification of common stressors, 3) selection of representative sampling reaches, 4) macroinvertebrate sampling, and 5) developing suitable lab procedures. Stream typification resulted in 11 stream types covering 131 streams, at an altitude range from 664 m above sea level to 190 m below sea level. Apart from the perennially flowing Jordan River and its headwaters, the majority of streams in the catchment are intermittent or quasi-ephemeral. Sampling sites were selected to represent the most dominant stream types and the most common typical stressors, predominantly related to damming, water abstraction, agriculture, recreational activities, and cattle grazing. Macroinvertebrates were sampled using a standardised multi-habitat protocol, resulting in a diverse community, including several rare and endemic species. The relationships between the macroinvertebrate community and various environmental features, water quality parameters and other local stressors (e.g. tourism, grazing) are currently being used for developing suitable ecological indicators. The evidence gained in this project will represent an extreme case of a heavily impacted water-stressed region.

**CONSERVATION & MANAGEMENT**

OS-04, TUESDAY, 5 JULY, 10:30–10:50

**Polarized versus unpolarized light pollution in triggering ecological traps for nocturnally-active insects**

Gábor HORVÁTH<sup>1</sup>, Bruce ROBERTSON<sup>2</sup>, Desiree CAMPBELL<sup>2</sup>, Colyer DUROVICH<sup>2</sup>,  
Ian HETTERICH<sup>2</sup>, Julia LES<sup>2</sup>

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Cases in which animals prefer inferior habitats are called ecological traps. Nocturnally-active insects are susceptible to ecological traps triggered by artificial lightings that mimic their primary navigational cue (the moon) and light that is polarized horizontally through reflection from man-made objects which mimics the appearance of water bodies where many oviposit. We designed a field experiment to estimate the relative importance of unpolarized versus polarized light in triggering ecological traps among terrestrial and emergent aquatic insects. Horizontal black, grey and white trays filled with transparent vegetable oil were illuminated by LED lamps with and without a matte white shading cylinder around the light source. The LED light was unpolarized, while the light reflected from the oil-trays was partially linearly polarized. All studied terrestrial and aquatic insect families gave more weight to unpolarized light in guiding habitat selection. Shading of the illuminating lamp reduced captures of both groups by about 75%. No terrestrial insects used polarized light in guiding their habitat selection, while half of the aquatic insect families did, weighting polarized versus unpolarized light in diverse ways. Our results illustrate that: (i) Two forms of photopollution – unpolarized and polarized light pollution – can interact in creating ecological traps. (ii) They can be additive or synergistic in their effects on increasing the attractiveness of trap habitats. (iii) Both terrestrial and aquatic insects exhibit a broad taxonomic predisposition for ecological traps formed by light pollution. These results also illustrate that emergent aquatic insects represent a first experimental system by which conservation science can expose the mechanism that trigger severe behavioural maladaptation.

**CONSERVATION & MANAGEMENT**

OS-08, TUESDAY, 5 JULY, 15:20–15:40

## **What do diving beetles say about fishponds management?**

Vojtěch KOLÁŘ<sup>1,2</sup>, Tomáš ONDÁŠ<sup>3</sup>, David S. BOUKAL<sup>1,2</sup>

<sup>1</sup>Institute of Entomology, Biology Centre, ASCR, Ceske Budejovice, Czech Republic

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We studied the influence of fishpond management and environmental characteristics on diving beetles (Coleoptera: Dytiscidae), which are important predators in aquatic systems. In 2014 we used live traps to study diving beetle communities in 117 ponds in South Bohemia. The ponds were divided in three categories: intensively managed, extensively managed, and without fish. In total 26 species of diving beetles were found (N=1346). Overall, the beetles preferred shallow littoral zones with cattail (*Typha*), manna grass (*Glyceria*) and reed (*Phragmites*). The number of species declined with increasing altitude and depth near the trap, while their abundance increased with pond area and amount of detritus near the trap. Beetles occurred more in ponds with lower pH, lower conductivity and higher oxygen content. More beetles were found in fishless ponds. On the other hand, some ponds with high density of fishes but well preserved littoral zone had similar communities of diving beetles to the fishless ponds. This shows that high density of fish in ponds decreases the diversity and abundance of diving beetles, most likely because it decreases the vegetation in littoral zone. During the survey, four new localities of *Graphoderus bilineatus* were found. The species is protected by NATURA 2000 and has been known from very few recent localities in the Třeboň area.

**CONSERVATION & MANAGEMENT**

OS-04, TUESDAY, 5 JULY, 11:10–11:30

**What is an ecological flow supporting EU Water Framework Directive objectives in small alpine rivers?**

Vesna PETKOVSKA, Gorazd URBANIČ, Nataša SMOLAR-ŽVANUT, Darko ANZELJC

Institute for Water of the Republic of Slovenia, Ljubljana, Slovenia

Ecological characteristics of rivers are fundamentally determined by the flow regime. Due to constantly rising need of water use, modified flow regime now represents a major challenge for sustainable management of rivers and hence achieving the goals of Water Framework Directive (WFD) in Europe. The main goal of WFD is achievement or protection of good ecological status, fundamentally determined by biological quality elements (e.g. benthic invertebrates). Ecological status is defined in comparison to natural or reference conditions. In order to monitor the reference conditions, each member state should develop a reference network of sufficient number of sites of high status to provide a sufficient level of confidence about the reference conditions. Hence, in some river sections, the goal is to protect high ecological status. Where flow characteristics were modified the ecological flow (Qes) might be used as one of the measures, supporting the achievement of WFD's goals. But in the development of methods, used for setting Qes, the aims of WFD – good ecological status defined by aquatic assemblages was rarely considered. There was a need to define the ecological flow for potential small hydropower plant (HPP) with water abstraction, situated on one of the reference sections of Slovenian small alpine rivers. Hence, in order to protect high status of that river section our aim was to test the existing hydrological criteria for setting Qes in Slovenia, and provide terms for HPP operation on which high ecological status would still be achieved. In the analysis data from the investigated river were combined to data from other comparable small alpine rivers in Slovenia. More than 100 hydrological parameters, most applied in Europe, including those used in Slovenian Qes method, were calculated. Hydrological parameters were related to the results of ecological status assessment based on benthic invertebrates and fish, biological quality elements found to respond best to water abstraction. Our results suggest that ecological flow (the amount of water left in the river), defined by Slovenian method, might be necessary criteria for high status protection, but not also sufficient. The key is to ensure dynamic hydrological conditions, resembling natural regime as much as possible. Our analysis revealed as key parameters also the amount of the maximum abstracted water ( $m^3/s$ ) and the average abstracted water ( $m^3/s$ ), based on year constraint. The criteria for both were defined. Besides, using data on hydromorphological quality and degradation on some of investigated sites resulted in more severe criteria for abstraction where river habitats were degraded. Our analysis showed some relevant findings of the linkage between hydrological parameters and aquatic assemblages and should serve as guideline for updating the determination of the ecological flow.

**CONSERVATION & MANAGEMENT**

OS-08, TUESDAY, 5 JULY, 16:00–16:20

**Long-term changes in biodiversity of running waters:  
preliminary analysis of mayfly assemblages in the Czech  
Republic over last three decades**

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A gradual increase in annual mean temperatures and changes in temporal distribution of precipitation was recorded in the Czech Republic within past decades. The main objective of a research project “Monitoring of long-term changes in biological diversity of running waters during climate change: design, realisation, and implementation in the ARROW public information system” (acronym RIVERCHANGE) is to assess the influence of such changes on river biota. In the context of the research objective, the main freshwater biotic elements (benthic macroinvertebrates, phytobenthos, macrophytes and fish) were sampled at 84 selected sites in 2015 and historical records from previous research activities performed during last three decades were collected. Relevant abiotic data (land-use characteristics, hydromorphologic parameters, water quality analyses, daily temperatures and precipitation) are also available. Sites with near natural character were selected in order to eliminate changes induced directly by human activities. The spatial distribution within the Czech Republic was as uniform as possible. Within monitored freshwater organisms, mayflies are suitable for initial assessment due to their wide distribution, sensitivity and good knowledge about their life histories. This study presents the goals and current status of the RIVERCHANGE project and the first results of analyses of temporal changes in the composition of mayfly taxocoenoses with regard to changes in climatic, landscape and other characteristics. The shifts in taxonomical and also functional composition of the taxocoenoses will be discussed and comments on the distribution and autecology of selected taxa will be presented.

The research is supported by grant EHP-CZ02-OV-1-018-2014 from Iceland, Liechtenstein and Norway.

**FOOD WEBS**

OS-14, FRIDAY, 8 JULY, 10:30–10:50

**Feeding ecology of the Brown Trout (*Salmo trutta*) in two salmonid streams of the Bohemian Massif and the northern Limestone Alps under special consideration of Ephemeroptera-Plecoptera-Trichoptera Taxa**

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BOKU – University of Natural Resources and Life Sciences, Department of Water – Atmosphere - Environment, Institute of Hydrobiology and Aquatic Ecosystem Management, Vienna, Austria

The study is part of a master thesis at the University of Natural Resources and Life Sciences, Vienna. In total, 360 individuals of brown trout were taken from two near natural salmonid streams located in two different geographic regions of lower Austria. Fish were collected via electrofishing, weighed, measured and classified to two age classes (0+; 1+ and older). The samplings took place in spring, summer and winter season respectively between 2014 and 2015. Fish length and weights were recorded as well as total stomach content weight. Stomach contents were dissected in the laboratory, and the prey (mostly macroinvertebrates, seldom fish or other vertebrates) was identified to the lowest taxonomical level possible. The specimens were counted and weighted and their length was measured. The taxa were classified in drifting/non-drifting based on literature and own observations evaluate the feeding behavior of each trout individual. In addition, the importance of various food sources (aquatic, terrestrial) is highlighted. Detailed macroinvertebrate samples were taken from all available microhabitats in both rivers and various abiotic parameters (water depth, flow velocity, substrate type etc.) were synchronically documented. This will allow further analysis of interactions between fish, macroinvertebrates and specific habitat requirements and availability respectively. Analysis of the stomach contents show differences for different age classes within one river and between the two rivers respectively. Organisms known as frequently drifting (Baetidae, Simuliidae, Chironomidae) were the dominant prey in both rivers. Nevertheless, benthic uptake played an increasing role especially in winter, where e.g. the Trichoptera species *Micrasema minimum* and *Lepidostoma basale* were ingested in significant numbers.

**FOOD WEBS**

OS-14, FRIDAY, 8 JULY, 11:10–11:30

**Seasonal and spatial differences in the trophic spectrum of  
Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979)  
in the Mecsek Mountains, SW Hungary**

Alexandra HENCZ, Bálint PERNECKER, Réka BODA, Péter MAUCHART,  
Arnold MÓRA, Zoltán CSABAI

University of Pécs, Faculty of Sciences, Department of Hydrobiology, Pécs, Hungary

Odonata, likewise every aquatic insect plays an important role in trophic structures of lotic systems, but only a few families (such as Cordulegastridae) are restricted to small headwater streams. Dragonfly larvae are obligate carnivores, and generally they are ambush predators, using visual and mechanical signals for catching prey. Most probably the quantity and quality of potential prey highly determine availability of the stream section for *C. heros* and its number of individuals. Our aim was to test whether the prey availability significantly affects the numbers of individuals of *C. heros* and the structure of the population (proportion of each larval stages). We also aimed to explore the available trophic spectrum for *C. heros* in small headwater streams and describe its seasonal changes. Quantitative aquatic macroinvertebrate sampling was carried out according to the AQEM protocol in four second order headwater streams in the Mecsek Mountains from 2009 to 2010 seasonally, and additional sampling focused on *C. heros* larvae has been conducted from June 2011 to May 2012 in monthly intervals in the same watercourses. For every larvae six different body dimensions were measured, from which head width and wing sheath length were used for determining larval stages. 76 environmental variables (physico-chemistry, bed morphology, spatial, vegetation, naturalness and climatic parameters) were also measured or calculated. At the four sampling sites 677 *C. heros* larvae were found, furthermore 34537 individuals belonging to 124 other macroinvertebrate taxa were collected. Based on the population structure and the numbers of *C. heros* individuals our sites were grouped to different types, but on this small spatial scale the environmental variables definitely did not explain the differences between the types. However, the prey density and composition showed significant influence on the number of *C. heros* individuals and the population structure, explaining the differences between the sites.



**FOOD WEBS**

OS-14, FRIDAY, 8 JULY, 10:50–11:10

**Benthic macroinvertebrate assemblage response to round  
(*Neogobius melanostomus*) and tubenose (*Proterorhinus  
semilunaris*) goby predation pressure**

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Kevin ROCHE<sup>1</sup>, Luděk ŠLAPANSKÝ<sup>1,2</sup>, Pavel JURAJDA<sup>1</sup>

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Ponto-Caspian gobies have significantly expanded their ranges in Europe since the 1990s, primarily through introduction by shipping at ports with subsequent spreading along navigable main rivers and tributaries. One of the main assumed impacts of invasive gobies is predation pressure on benthic invertebrates. While there have been numerous dietary studies undertaken recently, quantitative evaluations of their impact on European river ecosystems are scarce. In this study, we investigate the impact of two gobiid species, the tubenose (*Proterorhinus semilunaris*) and round (*Neogobius melanostomus*) goby, on the macroinvertebrate assemblage of a medium-sized lowland river (River Dyje, Czech Republic). Ten net bags (5×4 mm and 5×20 mm mesh size) with cleaned local rip-rap stones (mean total surface area 1.2 m<sup>2</sup>) were exposed for one month on the river bottom near the bank. Both mesh sizes allowed colonisation by macroinvertebrates, but only the larger one allowed the goby access. Two sites were investigated, the downstream one hosting both gobiid species and the upstream site with tubenose goby only. Gobies displayed strong negative impact on benthic invertebrate in nearshore habitat at both sites. While tubenose goby were able to reduce invertebrates by 15%, the decrease of invertebrate abundance made 36% in co-presence of round goby. Both gobies ingest preferentially larger invertebrates, in which leads to smaller overall body size in zoobenthos assemblages. Tubenose gobies had a significant ( $p < 0.05$ ) negative impact on Annelida, Gastropoda, Crustacea and on Ephemeroptera nymphs. Significant reduction of the same macroinvertebrate groups plus of Bivalvia, Odonata nymphs and Chironomidae larvae was recorded in co-presence of round goby. The results proved that gobies have a significant negative impact on benthic invertebrate in relative low density (up to 1.5 ind./m).



**FOOD WEBS**

OS-14, FRIDAY, 8 JULY, 10:10–10:30

**Impacts of climate change on food webs: role of individual phenotypic plasticity and non-trophic interactions**

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Understanding the dependence of species interaction strengths on environmental factors, species traits and species diversity is crucial to predict community dynamics and persistence in a rapidly changing world. Using a cladoceran–dragonfly system, we experimentally investigated the effects of thermal acclimation, acute temperature change and enrichment on predator functional response and metabolic rate and calculated their consequences on trophic interaction strength and food-chain stability. We also measured the effects of predator diversity, prey density, and temperature on trophic and non-trophic interaction strengths within a freshwater food web. We found that (1) thermal acclimation of predators can buffer negative impacts of environmental change on predators and increase food-web stability and persistence, (2) species interaction strengths (i.e. the combined result of trophic and non-trophic interactions) cannot be predicted from trophic interactions alone and (3) temperature and prey density affect strengths of both interaction types, sometimes in opposite directions. We conclude that the effects of acclimation and non-trophic interactions should not be overlooked if we aim to understand the effects of climate change on species interaction strength and food-web stability.

This work was supported by Grant Agency of the Czech Republic (project nr. 14-29857S).

**INVASIVE SPECIES**

OS-09, THURSDAY, 7 JULY, 11:10–11:30

**Niche differentiation of invasive Ponto-Caspian gammarids  
(Crustacea: Amphipoda) – insights from the 3rd Joint Danube  
Survey**

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The invasion of *Dikerogammarus villosus* (Sowinsky, 1894) – the ‘killer shrimp’ – resulted in the decline or local extinction of several native or non-Ponto-Caspian invasive gammarid species throughout Central and Western Europe. Other invasive Ponto-Caspian gammarids are able to co-exist with the species as a result of their shared evolutionary history, however, the ways of their niche differentiation have not been clarified yet. Based on the multi-habitat samples collected during the 3rd Joint Danube Survey, we identified current velocity as the main factor allowing the niche segregation of the three invasive *Dikerogammarus* spp. *Trichogammarus trichiatus* (Martynov, 1932) appeared to show a preference for woody debris, whereas *Obesogammarus obesus* (G. O. Sars, 1894) reached peak densities on clayey substrates, thus these two species separated from *Dikerogammarus* spp. at the mesohabitat scale. On the contrary, the substrate preference of *Chaetogammarus ischnus* (Stebbing, 1899) overlapped largely with that of *Dikerogammarus* spp. (especially *D. haemobaphes* (Eichwald, 1841)), however, its smaller and more slender body might allow the species to avoid physical contact with large *Dikerogammarus* specimens.

**INVASIVE SPECIES**

OS-09, THURSDAY, 7 JULY, 11:30–11:50

**First record of freshwater jellyfish *Craspedacusta sowerbii* in a Mediterranean karstic river Krka (Croatia) and a promising method for polyp detection**

Renata MATONIČKIN KEPČIJA, Zlatko MIHALJEVIĆ, Marko MILIŠA, Marija IVKOVIĆ,  
Mirela SERTIĆ PERIĆ

Division of Zoology, Department of Biology, Faculty of Science, University of Zagreb, Zagreb, Croatia

*Craspedacusta sowerbii* is a freshwater hydrozoan species considered to be invasive in the EU. The species originates from Eastern Asia and has colonised all continents with the exception of Antarctica. *Craspedacusta sowerbii* is mainly detected in a stage of hydromedusae, albeit there are evidences that species has much wider distribution, persisting in many water bodies in a stage of hydropolyp. Whereas hydromedusae of this species can influence several trophic levels in plankton, little is known on the hydropolyp influence. The data on *C. sowerbii* distribution in Croatia are very incomplete, with only few scientific studies. Current research presents first record of *C. sowerbii* in a karstic Mediterranean river Krka, within National Park Krka, Croatia. The hydrozoan was initially detected during a broader study of tufa deposition and periphyton development within NP Krka. Later on, the study was extended to studying *C. sowerbii* distribution. Aiming to cover a broad range of the hydrozoan traits, artificial substrates (glass slides) were submerged in lotic and lentic habitats at three differing sites (i.e., at tufa barrier Skradinski buk, and within two upstream barrage lakes – natural Visovac Lake, and man-made Brljan Lake). The slides were retrieved every 1-2 months during 2014 and 2015. Natural substrate (moss covered tufa and cobbles) within the sites was also sampled and checked for the presence of polyps. Observations were done on live material. *Craspedacusta sowerbii* was detected only in tufa barrier lotic environment, contrary to some prior studies' findings on the species preference for stagnant water habitats. We detected polyps, both single and in colonies, and frustules. The latter are produced through budding of polyps, evidencing asexual reproduction. Artificial substrates had around 15× higher densities of polyps compared to natural substrates (average 170 ind./dm<sup>2</sup> vs. 11 ind./dm<sup>2</sup>, respectively). Accordingly, *C. sowerbii* might prefer substrates with less developed periphyton. It is, however, possible that the artificial glass-substrate provided better possibility for polyp detection. Polyps are small and difficult to detect under stereomicroscop, while glass slides allowed microscopic observations. Method used in this investigation might be a novel inexpensive tool to monitor *C. sowerbii* in water bodies, allowing detection of polyp stage. Hydropolyps were observed to mostly feed on aquatic insect larvae. They seemed uninterested on protozoans as pray as some ciliates (e.g., *Vorticella* spp. and *Stentor coeruleus*) were observed attached and intact on body stalks of polyps. These findings give new information on the ecology of *C. sowerbii* in benthic form, and its potential ecological niche. Further studies are needed to test its invasive potential and impact, both in benthos and in plankton.

**INVASIVE SPECIES**

OS-09, THURSDAY, 7 JULY, 10:30–10:50

**Conquerors or exiles? Impact of interference competition among invasive gammarideans on their dispersal rates**

Michał RACHALEWSKI<sup>1</sup>, Jarosław KOBĄK<sup>2</sup>, Karolina BĄCELA-SPYCHALSKA<sup>1</sup>

<sup>1</sup>Department of Invertebrate Zoology and Hydrobiology, University of Łódź, Łódź, Poland

<sup>2</sup>Department of Invertebrate Zoology, Nicolaus Copernicus University, Toruń, Poland

Several Ponto-Caspian gammarids have successfully invaded European waters, affecting local communities by predation and competition. Their ranges, dispersal rates and introduction times vary across Europe, which may result from their interspecific interactions, accelerating or reducing migrations from communities of different compositions. We checked this hypothesis in laboratory by testing interference competition among three invaders: *Dikerogammarus villosus*, *D. haemobaphes* and *Pontogammarus robustoides*, that often co-occur. We conducted experiments in 140-cm long tanks with gravel substratum, divided into seven compartments. We introduced 25 “residents” into the outermost compartment, separated with a barrier. After 1 h, we introduced 25 “intruders”. After the next 1 h, we removed the barrier and the gammarids dispersed in the tank for 4 or 20 h. Finally, we counted the gammarids in the compartments. We tested all pairwise species combinations (N=10) and single species controls (the same species as a resident and intruder). Thus, we could compare gammarid dispersal in the presence of heterospecific residents or intruders with that exhibited in single species situations. Both *Dikerogammarus* species migrated less than *P. robustoides*. *Dikerogammarus villosus* displaced both congeners and reduced its own motility in their presence. *Pontogammarus robustoides* stimulated migrations of *D. haemobaphes*. The presence of *D. haemobaphes* stimulated the short-time movement of *P. robustoides* but reduced its long-time relocation. In general, the presence of stronger competitors tended to increase gammarid dispersal, whereas the occurrence of weaker congeners reduced the mobility of gammarids, perhaps putting more effort into defending their local shelters. Our results show that competitive interactions, rather than invasive potential, may affect dispersal rates of invasive gammarids and account for the fact that the weakest competitor, *D. haemobaphes* usually appeared first, whereas the strongest species, *D. villosus* was the latest newcomer in many novel areas. Our study was supported by National Science Centre grants 2011/03/D/NZ8/03012 and 2012/05/B/NZ8/00479.

**INVASIVE SPECIES**

OS-09, THURSDAY, 7 JULY, 10:50–11:10

**The impact of the invasive *Dikerogammarus villosus* on  
benthic communities**

Carola WINKELMANN<sup>1</sup>, Susanne WORISCHKA<sup>1</sup>, Jochen BECKER<sup>1</sup>, Franz SCHÖLL<sup>2</sup>,  
Claudia HELLMANN<sup>1</sup>

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The invasive amphipod *Dikerogammarus villosus* is assumed to threaten biodiversity by particularly reducing native invertebrates and displacing other amphipods in large European rivers. Despite of some evidences for its negative impact on invertebrates in small scaled experiments, its impact on natural communities seems to be variable and long-term analyses are rare. We used a long-term data set in the Upper Elbe and Middle Rhine (Germany, 1990-2013) to analyse river-specific invasion patterns and changes in the community structure and performed two mesocosms experiments at these river sites to identify the effects of different densities of *D. villosus* on the community. We assumed that *D. villosus* was a driver for changes in the river community structure. We found different invasion pattern of *D. villosus* in the two rivers with a faster invasion in River Elbe. The impact of *D. villosus* on the community composition in the studied rivers was weak and indicated a high annual variability in the long-term data. The correlations between the densities of the invader and other taxa were mostly positive in the River Rhine. The community in the River Rhine seemed to be more vulnerable to the *D. villosus* invasion than in the River Elbe due to the much higher dominance of invasive species and their positive interactions, as suggested by the 'invasional meltdown' theory. In the mesocosm experiment, the biomass gradient of *D. villosus* adults did not cause significant changes in the communities and species-specific effects were only observed in the River Rhine. The study suggests that the community-level effects of invasion are strongly specific to the river ecosystem.

**MISCELLANEOUS**

OS-06, TUESDAY, 5 JULY, 13:00–13:20

## **Problems of detecting mussel populations in large rivers**

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Possibilities of detection of Unionidae taxa in deep water bodies with high turbidity is analysed based on field experiences. According to our observations the mussel distributional pattern is influenced principally by the relevant river hydraulic condition-complex. The effective detection of taxa depends on the recovery of suitable habitats. The visual estimation of the physiognomic character of the large river could help for that, and, field sampling should be started only as a next step. Thus, finding the habitat is the prerequisite of sampling efficiency. Although a lot of mussel data exist, the proper description of the distributional pattern and size of populations are not sufficiently known in case of our any native Unionidae taxa. Similarly, there is no exact information about the exact distribution and size of *Unio crassus* (Natura 2000 species) populations inhibiting the development of effective nature conservation strategies for saving this essential species. According to our present observations so far the stability of bed material providing appropriate conditions for mussels during their whole life span is principal comparing to water quality preconditions. We illustrate with examples taken from the Romanian Lower Danube that pattern of mussel stocks and bed material transport processes and stability are mutually fit together. Our hypothesis is reflected to other smaller flowing and large standing) water bodies where hydromorphological and hydraulic conditions seem to be most important for the existence of mussel populations. Finally it is concluded that submerging sampling method is necessary for the effective assessment of mussel species.

**MISCELLANEOUS**

OS-06, TUESDAY, 5 JULY, 13:20–13:40

**Spatial and temporal scales in groundwater ecology**

Oana Teodora MOLDOVAN

Emil Racoviță Institute of Speleology, Cluj Napoca, Romania

Sampling frequency and spatial distribution of selected sampling points are crucial for understanding diversity and fauna dynamics in groundwater habitats. We tested these assumptions in two different settings by adding the measured physico-chemical parameters in the analysis. Different spatial and temporal scales were applied for hypogean fauna from the hyporheic zone on a polluted river stretch and the dripping water in a cave. Sampling of the hyporheic zone and the dripping water showed contrasting biodiversity and abundance patterns at different time scales. Correlations with water physico-chemical parameters for seasonal series were sometimes contradictory and appeared to be artifacts related to sparse data for the hyporheic zone. The results show that monthly or more frequent sampling together with increasing density of sampling points and in different parts of one river or one cave are required for a complete assessment of biodiversity and fauna dynamics in the groundwater habitats and for studying the relationship with surface ecosystems.

**MISCELLANEOUS**

OS-06, TUESDAY, 5 JULY, 13:40–14:00

**Microscale land use patterns and its effect on a lowland stream's resilience of aquatic macroinvertebrate community**

Vivien VISKI<sup>1</sup>, Csaba DEÁK<sup>2</sup>, István GRIGORSZKY<sup>1</sup>, Eszter Á. KRASZNAI<sup>3,4</sup>,  
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In Hungary the most specific watercourse type is the small stream. Most of the Hungarian lowland streams characterized as a heavily impacted one by mainly diffuse pollution due to agricultural land use. The physical environment and land use play an extremely important role for the functioning of the stream ecosystems by determining the environment and the habitat characteristics used by stream organisms. We selected two streams, which differs from their overall land use pattern. The first one is mainly flow through agricultural field (41% of the whole length) the other was more divers in land use forms. We define six microscale patterns (forests, agricultural fields, meadows, open or with closed macrophyte cover) and made 4–4 replicates from these types along the river stretch which resulted 24–24 samples per streams. On each sampling site three samples were taken (right bank of the stream, left bank, and one from the middle). We calculated the resilience of the upstream community due to the microscale land use. We determine the effect of the land use through the stream stretch by Principal Response Curves (PRC) analysis. The results suggest that the resilience of the lowland stream community decrease along the river stretch. The microscale land use such as forested and shaded stream sections helps to recover the agricultural land use shocks. After an agricultural area the diversity and the abundance of the macroinvertebrate community decrease, but when forested or shaded area follows then the community structure restored. Therefore in lowland the increase of microscale land use diversity could help in stream restoration project and to increase the ecological quality.



**MONITORING & ASSESSMENT**

OS-05, TUESDAY, 5 JULY, 13:20–13:40

**Water quality assessment of Firtına Stream using various  
macroinvertebrate-based metrics and physicochemical  
variables**

Özge BAŞÖREN, Nilgün KAZANCI

Hacettepe University, Department of Biology, Ankara, Turkey

Benthic macroinvertebrates are used as indicators in biomonitoring of habitat quality of aquatic ecosystems because they are sensitive to changes of environmental conditions and they reflect habitat quality. Firtına Stream is one of the streams in the Eastern Black Sea Region. Firtına Valley is one of WWF's Global 200 vulnerable Ecoregions but it is under serious threat by planned construction of hydroelectric power plants, industrial and agricultural pollution. In this study, benthic macroinvertebrate samples were collected and certain physicochemical variables (water temperature, pH, dissolved oxygen, electrical conductivity etc.) were measured at 10 sites in July of 2006 and July of 2008 to assess the ecological quality of Firtına Stream in Eastern Black Sea region. A total of 2080 individuals were collected from 10 sites and 36 families were identified. BMWP (Biological monitoring working party), Hilsenhoff family index (FBI), EP-Taxa, EPT-Taxa and EPTCBO (Ephemeroptera, Plecoptera, Trichoptera, Coleoptera, Bivalvia, Odonata) and functional feeding group ratio (% Grazers-Scrapers, % Shredders and % Gatherers-Collectors) that are proposed to use by European Union Water Framework Directive (WFD) were applied to assess the water qualities of investigated sites. This study is the first study in order to determine the habitat quality of Firtına Stream using physicochemical variables and benthic macroinvertebrates.

**MONITORING & ASSESSMENT**

OS-05, TUESDAY, 5 JULY, 13:40–14:00

**Aquatic microorganisms and invertebrates monitoring in  
Romanian show caves**

Silviu BERCEA<sup>1</sup>, Ruxandra NASTASE-BUCUR<sup>1</sup>, Marius KENESZ<sup>1</sup>,  
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The study involved four Romanian show caves: Urșilor, Muierilor, Meziad and Polovragi, all located in the Carpathian Mountains. Beside climatic monitoring, biological and microbiological monitoring were undertaken in the period between March 2015 and March 2016. Microbiological monitoring is used in environmental monitoring and is a good indicator for the water quality together with the diversity and abundance of aquatic invertebrates. Monthly or bimestrial sampling was done for the same 11 pools formed by drip water, which flow was continuously registered. Some of the sampling points are along the tourist trail while others are located in protected areas of caves. Microbiological monitoring test kits (RIDA@Count, R-Biopharm AG, Germany) were used as a handy tool in indicating the microbe relative abundance in cave pools. The test plates revealed the total bacterial count, yeasts and molds count, and clinically important, human-associated groups as Enterobacteriaceae and Coliform bacteria, with specific indicators for *Escherichia coli*. The overall number of colony-forming units (CFU) was lower in the winter months, although almost a permanent presence of microbes was found in the sampling points. The total number of viable bacteria spiked at over 1400 CFU/mL of water, while on some occasions it was zero. Fungi colonies were almost constantly present, although in lower numbers. Human pathogens were found in cave water, creating a need to warn visitors not to drink from any sources of water inside the cave, as they represent a potential health hazard. The water volume entering the cave was lower in the summer months and tourist traffic slowly arose from March to August, yet these parameters do not have a correlation with the number of CFU/mL of water from the sampled pools. The position of the sampled pools in regard to the tourist trail and the varying seasonal peaks in the sampling points, might suggest that most of the bacterial loads are being determined by the source of the water feeding each pool and that tourism negatively impacted on both diversity and abundance of invertebrates. 16S rRNA gene sequencing is in process for taxa identification.

**MONITORING & ASSESSMENT**

OS-10, THURSDAY, 7 JULY, 13:00–13:20

**Comparison of indicator potential of subfossil chironomids,  
diatoms and cladocerans: a paleolimnological perspective**

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Remains of chironomids, diatoms and cladocerans are common in lake sediment and consequently are frequently used as indicators to track past ecological changes in paleolimnological studies. Because of the time consuming procedure, however, they are seldom used all together in the paleolimnological reconstructions. Lake Popradské pleso is a subalpine lake located in the Tatra Mts. which has gone through significant anthropic disturbances that are well documented and thus it serves as a great model lake for testing replies of paleoindicators. The goal of the present study is to compare the response of subfossil chironomids, diatoms and cladocerans recorded in a sediment core representing the last 200 years. Comparing stratigraphic changes of each group with the milestones of the documented changes, we wanted to know what have the responses of the groups in common and where they differ. A total of 11 cladoceran, 37 chironomid and 124 diatom taxa were recorded in the 10 cm long sediment sequence. Cladocera showed the biggest changes at community level (2 SD units measured as DCA gradient length), followed by Chironomidae (1.8 SD units) and diatoms (1.5 SD). The most significant changes occurred in all three groups simultaneously when the lake became a subject to severe organic pollution, even though the response time differed for particular groups. Interestingly, the chironomid composition returned to the original one after the source of pollution has been removed, while that of cladocerans and diatoms remained the same. Beside the common response, each group has its specific response on community level that was not accompanied by changes in the other two groups. These responses together with the ecological knowledge of the group could bring extra information on the character of the environmental change.

The paleolimnological research of lake Popradské pleso was supported by grant schemes VEGA 1/0180/12 and VEGA 1/0664/15.

**MONITORING & ASSESSMENT**

OS-10, THURSDAY, 7 JULY, 14:00–14:20

**Ecological potential of the Serbian stretch of the Danube  
River based on macroinvertebrate communities – 2014-15  
case study**

Nikola MARINKOVIĆ, Nataša POPOVIĆ, Bojana TUBIĆ, Jelena TOMOVIĆ,  
Maja RAKOVIĆ, Vesna ĐIKANOVIĆ, Momir PAUNOVIĆ

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The Danube is one of the biggest European rivers and flows through many cities. The basin is densely populated and has developed industry, agriculture and river and road traffic. The river is under great anthropogenic pressure. This paper presents an assessment of ecological status of the Danube River through Serbia (1262-851 rkm) based on macroinvertebrate communities. Sampling was carried out twice in the period of low water level (September and November 2014), also two times during high water level (April and May 2015). Macroinvertebrate samples were collected from 12 localities with benthological hand nets (mesh size 500 µm) applying kick & sweep multihabitat procedure. The following indices were calculated to assess the ecological status: Total number of taxa, Diversity Index (H'), Saprobic Index (SI), Biological Monitoring Working Party (BMWP), Average Score Per Taxon (ASPT) and participation of Oligochaeta (Tubificidae) in total community. In total 156 taxa, from 16 groups, were identified. Oligochaeta was the most dominant taxa with the highest abundance in macroinvertebrate community, while Gastropoda and Diptera were subdominant. Study of macroinvertebrate community during low water regime showed presence of 101 taxa in September and 51 in November 2014. During high water regime, 62 and 48 taxa were recorded in April and May 2015, respectively. Based on available data and employed indices, ecological potential of the Danube in investigated stretch could be assessed as “moderate” to “poor” (III-IV class). The researched stretch of the Danube River is under the impact of the Djerdap I and Djerdap II (Iron Gate) dams and large reservoirs constructed in the area. It is primarily under the influence of hydromorphological degradation and organic pollution.

**MONITORING & ASSESSMENT**

OS-05, TUESDAY, 5 JULY, 13:00–13:20

**Macroinvertebrate taxonomic groups necessary for the  
reliable calculation of taxonomic distinctness index:  
potential metric for water and habitat quality assessment**

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Multimetric approaches are commonly used in bioassessment programs to assess the environmental degradation, especially water and habitat quality of the aquatic ecosystems. However, some groups of macroinvertebrates are usually not included in the monitoring programs, due to the cost-effectiveness and the lack of expertise regarding the identification process. We here wanted to test the utility of the taxonomic distinctness index (delta+) as a potential metric for water and habitat quality assessment when different taxonomic groups are included in the analysis. To realize this goal, three tasks were defined: (1) to calculate the delta+ index for the following taxa groups: macroinvertebrates in total, the family Chironomidae, Ephemeroptera-Plecoptera-Trichoptera (EPT) group and macroinvertebrates without the family Chironomidae, (2) to test the level of concordance between delta+ for different taxa groups and water and habitat quality gradients in lotic systems, and finally (3) to define the most appropriate taxonomic groups which can be used as a surrogate for delta+ calculation. As a model for this study we used macroinvertebrate community data of the Southern Morava river basin, Serbia. The possible relationship between values of delta+ index and water and habitat quality gradient were examined using categorical principal components analysis (CatPCA). The results of the study revealed that all investigated taxa groups, presented by delta+ index were highly correlated with the indicators of water and habitat quality degradation. The CatPCA analysis extracted the first and the second dimensions which explained 42.56% and 15.98% of the total variance respectively. The first axis had high loadings of delta+, organic pollution indicators (BOD5, PO<sub>4</sub>-P, NH<sub>4</sub>-N and conductivity) and parameters of habitat quality (channel alteration and land use). The second axis was mostly associated with pH and velocity. This study showed that delta+ index based on macroinvertebrate information has a great potential for water and habitat quality assessment of lotic systems. Moreover, the EPT group and family Chironomidae could be separately used for delta+ calculation, providing sufficient level of information for the water and habitat quality assessment.

**MONITORING & ASSESSMENT**

OS-05, TUESDAY, 5 JULY, 14:00–14:20

**New method for retrospective bioindication of stream drying up based on the analysis of taxonomical and functional composition of aquatic macroinvertebrates**

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Flow abruption or complete drying up of small streams (up to 4th Strahler order) has become more frequent in the temperate zone in the last decades probably as a consequence of climate change together with human alterations of hydrological regime. Irrespective of its origin, the increase of stream intermittency brings new requirements on water management which thus needs tools for the assessment of drought impacts. The novel method developed for Czech streams during the BIODROUGHT project ([www.biodrought.eu](http://www.biodrought.eu)) enables retrospective bioindication of dry episodes in stream history based on the analysis of benthic macroinvertebrates. The method comprises the calculation of biological metrics related to drought duration and the spatial extent of affected stretch to evaluate the magnitude of stream impairment by drought during the preceding vegetation season. The dry episode is defined as the abruption of flow continuity and (using datalogger records) three stream types were distinguished based on the duration and spatial extent of drought disturbance: permanent streams with continual flow, vulnerable streams with short flow abruptions (duration < 7 days, spatial extent in hundreds of metres) and intermittent streams (duration > 7 days, dry stretch > 1 km). Altogether, 110 three-minute multihabitat kick samples were taken from 20 streams (arranged in 10 pairs consisting of one permanent and one disturbed by drought) in spring and autumn seasons (2012–14). Based on literature review, 35 species traits related to species resistance or resilience to drought were chosen. More than 350 indicators of stream permanency or intermittency were identified using Indicator Species Analyses. Representation of drought sensitive groups (e.g. aquatic insects like EPT taxa) and changes in the taxonomical composition of the whole community were analysed too. Season specific approach was used in the study (spring and autumn data were analysed separately) and LDA (Linear discriminant analysis) was employed to select the best combination of metrics to distinguish between the three stream types. Based on the LDA results, we defined discriminant function describing the gradient from permanent to intermittent streams, which can be used to classify each sample to one of the three distinguished stream types with defined probability. The developed method is suitable not only for the recognition of drought impact in stream history but also for the efficient evaluation of measures aimed at the reduction of negative impacts of drought on water courses. Due to variable ability of fauna to reflect the “footprint of drought”, which depends also on specific local conditions of each site and region (e.g. availability of refugia, climate type, drought frequency etc.), the response of assemblages can slightly differ on large spatial scale. The method is applicable in temperate region but has to be adapted to the specific conditions of each country for practical use in water management.

**MONITORING & ASSESSMENT**

OS-03, MONDAY, 4 JULY, 13:00–13:20

**Key zoobenthos inhabitants as indicators of hydrological dynamics in karst springs**

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Springs as ecotones and specific autochthonous inland freshwater ecosystems have high integrity and harbor specific species composition caused by various hydromorphological forces and hydrological dynamics. Three karst springs in Croatia were studied in order to assess the influence of various drought regimes on their invertebrate assemblages. The analyzed springs were: Kupa (a limnocene karst spring with permanent discharge), Majerovo Vrilo (a limnocene karst spring, one of the Gacka river's springs that was last documented to have dried up in the 1950s) and Krčić (a descending intermittent karst spring that dries up annually). Four seasonal samplings (of 20 crenozoobenthos sub-samples) were conducted during 2014 with a 200 µm mesh net. Microhabitat coverage was assessed and sub-samples were taken separately and fixated accordingly. The zoobenthos community was analyzed with special emphasis on amphipod (Crustacea: Amphipoda), watermite (Acari: Hydrachnidia) and gastropod (Gastropoda) assemblages and microhabitat preferences. The aims were: to compare temporal aquatic fauna (i.e. watermites) vs. permanent aquatic fauna (i.e. amphipods and gastropods), to emphasize key indicators for temporal vs. perennial springs, and to examine the role of these invertebrate groups in crenozoobenthos composition. Microhabitat preferences (lithal vs. aquatic macrophyte coverage) were also analyzed in order to determine their influence in zoobenthos composition and to assess their 'refuge' role in dry phases. This research also brings a comprehensive overview of analyzed springs, including composition, structure and seasonal variations of macroinvertebrates. Diversity and abundance of macroinvertebrates were higher at the perennial springs than at the intermittent spring. The species composition is highly influenced by characteristics of flow regime, especially by longevity of hydrological permanency. Holistic methods to assess karst spring flows and appearance of key macroinvertebrate inhabitants can help establish the useful tool for target management of springs and spring brooks.



**MONITORING & ASSESSMENT**

OS-10, THURSDAY, 7 JULY, 13:40–14:00

**Monitoring and assessment of ecological status of rivers in  
Slovenia using benthic invertebrates**

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According to Slovenian Environmental Legislation, the Slovenian Environment Agency is responsible for monitoring and assessment of ecological and chemical status at the national level. In the Slovenian Environment Agency we are preparing monitoring programs which comply with the requirements of the Water Framework Directive (Directive 2000/60/EC) since 2006. We monitor different biological quality elements (benthic invertebrates, phytobenthos, macrophytes and fish), general physico-chemical elements (nitrate, phosphorus and BOD5), specific pollutants (pesticides, mineral oils and many others) and hydromorphological elements. For the assessment with benthic invertebrates, we are using national methodologies that were developed for all 74 ecological types of Slovenian rivers. With benthic invertebrates, we are assessing hydromorphological and general degradation (Slovenian multimetric index SMEIH) and saprobity (modified Saprobic index SIG3). The monitoring and assessment of ecological status is done for all 138 river water bodies, where we have around 180 monitoring sites. The latest assessment was done for the River Basin Management Plan 2015–2021. Assessment with benthic invertebrates shows that 30% of Slovenian river water bodies do not achieve a good ecological status due to hydromorphological and general degradation. 14% of the assessed river water bodies also do not achieve a good ecological status according to the modified saprobic index SIG3, an indicator of organic pollution.



**MONITORING & ASSESSMENT**

OS-03, MONDAY, 4 JULY, 13:20–13:40

**Indicative ecological status assessment of the Sturmica river catchment based on macroinvertebrates – a case study**

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Maja RAKOVIĆ<sup>2</sup>, Stoe SMILJKOV<sup>1</sup>, Vanja MARKOVIĆ<sup>2</sup>, Momir PAUNOVIĆ<sup>2</sup>

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The aim of this study was to provide indicative ecological status assessment of the water bodies in Strumica River Basin according to the requirements of the EU Water Framework Directive (WFD), based on aquatic macroinvertebrates. The material collected during June 2015 from 13 river water bodies as well as from two heavily modified water bodies – reservoirs Turija and Vodocha – were examined. Also, the analysis of the basic chemical parameters (Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, TP, TN) was performed. The following metrics were used for indicative status assessment: EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa richness, Biological Monitoring Working Party Score (BMWP) and Average Score Per Taxon (ASPT). Categorization of the ecological status and potential was made according to the classification of the surface waters as well as of heavily modified water bodies given in Annex V of WFD. Macroinvertebrate assemblage and BMWP, ASPT and EPT taxa richness indexes, indicated “healthy” river sector on Koleshinska River, Lomnica and Bezashtevska River and could be chosen to be the indicator for the reference conditions. In general, these water bodies had lowest concentrations of SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup> and TP. The structure of benthic community, as well as metrics values indicated high level of ecosystem stress or bad ecological status on Radovishka River 4, Stara River 2 and Vodenishnica. The highest values of SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup> and TP confirmed this statement. Additionally, Canonical Analyses (CA) was applied in order to display the variation in all the samples and species most efficiently. The applied indexes are effective for establishment of the ecological status/potential of the examined water bodies (as separated by CA), only if the requirements according WFD are implemented as type-specific biological reference conditions. For further work on ecological status assessment, type and stressor specific system should be developed. This involves the work on typology of water bodies, identification of reference and “near natural” sites, selection of appropriate metrics and development of type specific reference conditions, as well.

**MONITORING & ASSESSMENT**

OS-03, MONDAY, 4 JULY, 13:40–14:00

**Preliminary data on the “intercalibration exercise” of  
different river types in Bulgaria using benthic  
macroinvertebrates**

Rabia SOUFI, Violeta TYUFEKCHIEVA, Vesela EVTIMOVA, Yanka VIDINOVA,  
Maria KERAKOVA-GELEVA, Galia GEORGIEVA, Stefan STOICHEV, Ivailo DEDOV

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Bulgaria has joined the official intercalibration (IC) round in order to complete the state commitments for participation in the IC process of the categorization of rivers using the methods based on Biological Quality Elements (BQE). Only the methods for IC types R-E1a (= national type R2) and R-E1b (=R4) were successfully intercalibrated. Currently the procedure for types R-E2 (=R8) and R-E3 (=R7) is still ongoing for Bulgaria. Thus, a two-year research on the macroinvertebrate communities was conducted at selected study sites from:

- large lowland rivers R-E3 (31 sites), national type R7,
- medium-sized lowland rivers R-E2 (33 sites), national type R8,
- Mediterranean drying up rivers R-M2 (17 sites), national river type R14.

As a result a list of monitoring sites, selected parameters, metrics and methods for analyses of the benthic macroinvertebrates as one of the key BQE (together with phytobenthos, macrophytes and fishes) is prepared. The differences in quality and quantity composition of macrozoobenthic communities in the above-mentioned river types, as well as the indicative potential of BQE in relation to different types of anthropogenic pressure are analyzed. Validation of the final results will allow the successful IC of the methods for analysing these river types of surface water.

**MONITORING & ASSESSMENT**

OS-03, MONDAY, 4 JULY, 14:00–14:20

**Habitat quality assessment of streams in Altindere Valley  
National Park (Trabzon, Turkey) using physico-chemical  
variables and various biotic indices based on benthic  
invertebrates**

Gencer TÜRKMEN, Nilgün KAZANCI

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Altindere Valley, which is located in the province of Trabzon, covers an area of 4800 ha. This area was declared as a national park and was taken under protection in 1987. The importance of this national park has been increasing rapidly because it is also a touristic area. Besides of the effects of tourism, trout farms and hydroelectric power plants which are being considered to be built along the stream are the main threats to the natural structure of the national park. In this study, 11 sites were chosen on the streams in Altindere Valley, and benthic macroinvertebrates were sampled and some physico-chemical variables were measured simultaneously. Benthic macroinvertebrates were assessed using various biotic indices that are suggested to be used by the EU Water Framework Directive such as BWMP, EPT-Taxa, EP-Taxa and EPTCBO-Taxa. Hilsenhoff Family Index was also applied to the benthic macroinvertebrates. The results show that the water qualities of 11 sites, according to the physico-chemical variables, were between class I and II. It was determined that all sites had reference habitat condition. Both biotic and family index values were high and they also reflected the values that are expected for a protected habitat. However, it is predicted that presence of any kind of pollutants or habitat degradation at any level causes observable changes over benthic composition in the streams in Altindere Valley National Park. Furthermore, this study contains the first research results concerning with the aim of determining the reference habitats of the streams in Altindere Valley National Park, and the habitat qualities of the streams using physico-chemical variables and benthic macroinvertebrates.

**MONITORING & ASSESSMENT**

OS-10, THURSDAY, 7 JULY, 13:20–13:40

**The “first” ten years of aquatic macroinvertebrate-based  
water quality monitoring in Hungary**

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This first period of the Water Framework Directive (WFD) covers the establishment of the network, the development of national ecological quality assessment, the intercalibration process and the typological validation. The official macroinvertebrate monitoring network is currently run by the Regional Environmental Inspectorates. The network operates since 2007 and covers more than 1200 sampling sites. In the presentation we try to give a brief summary of the experiences and future insight. Hence the ecological quality assessment requires such a biological index that takes into account specific aspects of the biological quality elements, such as composition, abundance and diversity it has multimetric features. Multimetric indices (MMIs) which fulfil these criteria have become important tools for the assessment of the water quality through Europe. The other specific goal of this study was to demonstrate the use of multimetric index and how water quality and quantity managers could benefit by partitioning the pure Ecological Quality Ratios (EQRs) into its ecological components.

**STREAM ECOLOGY**

OS-12, THURSDAY, 7 JULY, 15:00–15:20

**Diel drift patterns of macroinvertebrates within a tufa-precipitating hydrosystem  
(Plitvice Lakes National Park, Croatia)**

Mirela SERTIĆ PERIĆ, Ines RADANOVIĆ, Renata MATONIČKIN KEPČIJA,  
Biserka PRIMC, Ivan HABDIJA

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Drift – a flow-mediated transport of aquatic organisms – is strongly affected by environmental and biotic settings, which can change on various spatio-temporal scales. Spatial drift patterns mostly depend on the spatial distribution of benthic communities, habitat type and physico-chemical properties, as well as on the degree to which organisms are able to move between different patches. Temporal drift fluctuations are greatly influenced by diel and seasonal flow conditions, aquatic and riparian vegetation features, predation-competition interactions, and organisms' life history strategies. Diel differences in macroinvertebrate drift patterns have mainly been attributed to behavioral cues (i.e., to active drift occurring as a predator-avoidance-mechanism). Due to highly fragmented and heterogeneous habitat structure, karst tufa-precipitating barrage hydrosystems (e.g., Plitvice Lakes National Park, Croatia) have evidenced unique macroinvertebrate drift patterns. Whereas the previous drift investigations within the Plitvice Lakes National Park have primarily been focused on seasonal drift trends (i.e., abiotic controls of macroinvertebrate drift), the present study deals with diel drift periodicity (i.e., potential biotic controls of drift) within the tufa-precipitating Plitvice Lakes barrage hydrosystem. The overall objective of the study was to examine quantitative and qualitative composition of drifting macroinvertebrates between barrier and pool microhabitats aligned along a study reach located within the karst barrage Plitvice Lakes hydrosystem. Specifically, we aimed to compare diel drift patterns between barriers and pools over a one year period (October 2006 – September 2007). Considering the entire study period, barriers displayed significantly ( $p < 0.0001$ ) higher macroinvertebrate drift densities in comparison to pools. At both microhabitat types, macroinvertebrate drift densities peaked in late spring, and during summer and autumn (i.e., June, July, October), averaging  $> 100 \text{ ind./m}^3$ . The peaking drift densities significantly differed ( $p < 0.05$ ) from the respective late winter/early spring (i.e., February to April) densities, which were about 5-fold lower at both microhabitat types. Monthly drift records yielded a strongly synchronous pattern between day and night. At barriers, drift reached significantly higher ( $p < 0.05$ ) values during day than at night. Within pools, drifting macroinvertebrates reached slightly (i.e., non-significant,  $p > 0.05$ ) higher densities during night, showing the reversed drift trend in comparison to barriers. Our results indicate that tufa barriers are loci of intense diel macroinvertebrate drift within the tufa-precipitating Plitvice Lakes hydrosystem. Furthermore, our results could provide an additional insight into life histories and drift behavior of certain macroinvertebrate taxa, as well as into mechanistic relationships between environmental and biotic controls of drift within the studied hydrosystem.

**STREAM ECOLOGY**

OS-12, THURSDAY, 7 JULY, 15:20–15:40

**Dynamics of benthic macroinvertebrate colonisation in leaf breakdown experiment in small rhithral streams in Latvia**

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Stream ecosystems have a number of functions, e.g., including processing and transport of allochthonous organic and inorganic matter. However, traditionally in the stream ecosystem studies the structure and dynamics of hydrobiont communities have been investigated. Among the most commonly applied tools to investigate the processes at ecosystem level, world-widely the leaf pack decomposition experiments have been applied. This method allows to find out the intensity of organic allochthonous matter (tree leaf litter) decomposition and the main taxonomic groups of decomposers. Leaf packs are used to study the impact of cities, intensive agriculture, heavy metals, pH, herbicides, droughts, temperature regime, etc. on the streams at ecosystem scale. Method can be applied to assess the results of restoration measures at ecosystem level. First leaf pack decomposition experiment in two Latvian streams at near natural state was started in October of 2015. Bags (mesh size of 5 mm) were filled up with air-dry grey alder *Alnus incana* leaves and installed in two small streams: Kumada (Gauja River basin) and Meltne (Daugava River basin). Since temperature is one of the main drivers of decomposition of organic matter, the temperature loggers were inserted in streams on the time of experiment. To investigate the dynamics of leaf decomposition, after each two weeks three leaf bags from each streams were removed (in total 5 times) and the weight loss, ash content and element analysis (C, H, N) were done. Fallen autumn leaves serve as food source, habitat and shelter for benthic macroinvertebrates, therefore it was planned to assess the colonisation dynamics of benthic macroinvertebrates on leaf bags and to identify main functional groups and biomass of benthic macroinvertebrates. Leaves as food resource for benthic macroinvertebrates are available only after the colonisation of microorganisms (bacteria and fungus) which are essential components of decomposition. Grey alder *Alnus incana* stands are one of the most common vegetation types along the river banks and alder leaves decay faster than leaves of other tree species. Dry weight loss of leaves after 8 weeks: Meltne Stream 38–48%; Kumada Stream 38–50% (67–100% after 10 weeks). Shredder functional feeding group dominated. The most abundant taxonomic groups were Plecoptera, Diptera: Chironomidae, Trichoptera: Limnephilidae and Diptera: Tipulidae.

The study was supported by project No. 526/2012, “Changes in Climate System Stability in Latvia and Impacts on Biogeochemical Flows of Substances Limiting Surface Water Quality”, funded by Latvian Council of Science.

**STREAM ECOLOGY**

OS-12, THURSDAY, 7 JULY, 15:40–16:00

**Occupancy frequency distribution in stream insects: effect of habitat type, niche characteristics and dispersal ability**

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One approach to examine patterns in the distribution of species in nature is the occupancy frequency distribution (OFD), which can delineate rare and common species. A number of ecological mechanisms have been associated with different forms of OFD. At one extreme end, there are generalists and common species with broad niches and wide regional distribution, that patterns are driven mainly by the dispersal based processes. At another extreme end, there are specialist and rare species with small ecological niches and restricted distribution, that patterns are influenced mainly by niche-related processes. For stream organisms the unimodal right-skewed OFDs are common, implying that most species are very rare. This pattern indicates that the assemblages are under environmental control and are driven by niche-related processes caused by the high environmental variability and geographical isolation of habitats. Beside niche based processes dispersal-related processes may also account for species distribution patterns and predict bimodal OFD in which most species are widespread or extremely restricted. In streams assemblages the bimodal OFD is rare and it can be seen in the case of generalist and widespread species groups. The relative role of niche-related and dispersal related processes can be varying depending on the positioning within the stream network, environmental heterogeneity and the extent of human perturbations. Furthermore, within the same assemblage the role of niche based and dispersal related processes can have different effect on the distribution pattern of species having different ecological (specialist vs. generalist) or biological (i.e. weak vs. good dispersal ability) traits. We examined the OFD of freshwater insect assemblages in different running water types (namely highland streams, lowland streams, highland rivers, lowland rivers) in Hungary. The sampling sites were surveyed twice (spring and late summer) during one year period to determine the seasonal influence. We deconstructed entire insect assemblages by ecological (niche breadth, niche position) and biological traits (dispersal ability) and tested the differences in the form of OFDs between the different ecologically and biologically defined groups separately in the four running water types. We hypothesized more right-skewed OFDs at sites, where the environmental heterogeneity and the geographical isolation are higher. We expected that the species which inhabit streams and highland watercourses show more right-skewed OFDs than species that inhabit rivers and lowland watercourses. We also expected that distribution patterns vary between the subgroups of species having different ecological and biological traits. Generally, the sets of species with marginal niche position, small niche breadth and weak dispersal ability are expected to show more right-skewed OFDs than species with non-marginal niche position, large niche breadth and good dispersal ability.



**TAXONOMY**

OS-16, FRIDAY, 8 JULY, 12:00–12:20

**Riffle beetles DNA Barcoding (Coleoptera: Elmidae) – past, present and future**

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The beetles are among the most numerous animal groups on Earth and they play with no doubt a key role in the ecosystem functioning. As such, they are also very important for monitoring impacts of environmental changes. Even they are studied intensively, the identification of beetle species often remains problematic. As in numerous other beetle taxa, the situation within the family Elmidae, regarding taxonomy and identification, is still far from satisfactory. The first described elmid was *Potamophilus acuminatus* (Fabricius, 1792), and as The World Catalogue published in 2016 mentions, there were 1498 species recognized until the end of 2014. However, new species still appear. Since 2004, more than 150 new species of Elmidae were described, suggesting that reasonable portion of the diversity of the family remains undescribed. The elmids are strictly aquatic, spending (with few exceptions) whole life submerged. Beside they form an important component of benthic macroinvertebrates of lotic habitats, they can serve as a good indicators of long-term ecological changes. Unfortunately, if compared with e.g. mayflies or caddisflies, little attention is paid to this group of aquatic insects. This is likely due to their lower abundance or slightly more complicated identification (larvae cannot often be determined to species, adults must be genitalized). Ecological monitoring or water quality assessments based on faunistics thus use elmid samples determined to genus only or left as Elmidae sp., which reduces resolution and value of such surveys. Using molecular barcodes and developing robust database could help overcome this problem. The main source of DNA barcodes is the project Barcode of Life, including ca. 4.5 million of sequences. Regarding riffle beetles of the family Elmidae, BOL database includes 464 sequences of ca. 30 species, which is very small fraction of almost 1500 known species. Here we summarize available barcode data on Elmidae, outline aims of the ongoing project focused on the Elmidae DNA barcoding and provide first results describing usefulness of barcodes gained.

This study was supported by the projects VEGA 2/0101/16 and APVV-0213-10.



**TAXONOMY**

OS-16, FRIDAY, 8 JULY, 12:20–12:40

**A comparative study of two epigean *Niphargus* species:  
phylogenetic relationships, phylogeography, morphology and  
ecology**

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The amphipod genus *Niphargus* is comprised of hundreds of eyeless and depigmented species with narrow ranges that inhabit subterranean freshwaters throughout the Western Palearctic. However, *N. hrabei* and *N. valachicus* are atypical due to their epigean life-style and large ranges, and they share many morphological and ecological characteristics. Because they exhibit broad and largely sympatric ranges, we explored their potential ecological niche overlap by comparison of morphological functional traits, patterns of co-occurrence and habitat selection. We also examined variation in the cytochrome oxidase I gene from populations across their ranges in order to test for intraspecific cryptic diversity and to verify the taxonomic status of two taxa formerly described from Hungary, *N. mediodanubialis* and *N. thermalis*. Furthermore, their phylogenetic relationships within the genus were investigated using the large ribosomal subunit (28S) nuclear marker. Modest genetic variation in both taxa indicated no evidence of cryptic lineages and suggests a relatively recent expansion. Based on morphological and molecular evidence, we found that *N. thermalis* is a younger synonym of *N. hrabei* and molecular data further supported a half-century old proposal for the synonymy of *N. mediodanubialis* with *N. valachicus*. Genus-wide phylogenetic analyses revealed that *N. hrabei* and *N. valachicus* are distantly related, the latter occupying a basal position in the phylogeny. Except for body size, both species were morphologically similar and seem only weakly differentiated ecologically. Though smaller in size, *N. hrabei* seems ecologically more tolerant, while *N. valachicus* might be a superior competitor owing to its larger size. Despite large scale sympatry, co-occurrence of both species was rare. Therefore, their present distributions may result from a dynamic relationship between dispersal ability and competitive strength. These widespread and euryoecious *Niphargus* species indicate that the genus successfully invaded epigean habitats at least two times independently, their morphological similarity is apparently convergent, in response to an epigean lifestyle.

**TAXONOMY**

OS-16, FRIDAY, 8 JULY, 12:40–13:00

**Diversity and origin of freshwater gammarids from Crete and Peloponnese**

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The Mediterranean Region is known as one of the most precious biodiversity hotspots in the world. However, majority of studies upon Gammaridae of the region focused mostly on marine species, leaving aside the freshwater fauna. So far, around 120 freshwater species of two genera, *Gammarus* Fabricius, 1775 and *Echinogammarus* Stebbing, 1899, have been reported from the area, with only 15 known from the Mediterranean islands. Given the very high cryptic diversity discovered recently in European gammarids and relative scarcity of studies upon insular species, we conclude that number of species already reported both from the mainland and from these islands may be underestimated. Our main goal is to reveal the diversity, phylogenetic relationships and origin of freshwater gammarids inhabiting Crete, a large Mediterranean island of continental origin, and Peloponnese, a mountainous peninsula at the southernmost end of the Balkans. Based on the materials collected in 2011 and 2015, we have revealed presence of at least five freshwater species on Crete. Based on morphology four of them could be identified as the members of *Echinogammarus* already known from Crete. Also we have revealed presence of one species new for science and belonging to *Gammarus*, genus that has not been yet described from Cretan freshwaters. Interestingly, despite the wide distribution of the new species, it does not present any genetic diversity between the sites. It suggests that the colonisation took place recently, probably during Pleistocene and strong bottleneck effect is still observed. Additionally, we revealed presence of ten freshwater species of *Gammarus* present on Peloponnese. Molecular species delimitation methods based on molecular markers and morphological analyses supported their distinctness. Several both mitochondrial (COI and 16S) and nuclear (28S, EF- $\alpha$  and ITS-1) markers were used for the time-calibrated phylogeny reconstruction to reveal the origin of freshwater gammarids inhabiting Crete and Peloponnese as well as their phylogenetic relationship with other Mediterranean species.

**TAXONOMY**

OS-16, FRIDAY, 8 JULY, 11:40–12:00

**Evidence of cryptic and pseudocryptic speciation in *Brachypodopsis baumi* species complex (Acari, Hydrachnidia, Aturidae) from Borneo, with description of three new species**

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Water mites of the *Brachypodopsis baumi* species complex are confined to SE Asia, and up to now have been considered to belong to one species only. In the present study we used morphological data and DNA barcoding (556 bp of the mitochondrial gene cytochrome *c* oxidase subunit I, *COI*) to resolve taxonomic issues within the species complex from Borneo. The use of an integrative-taxonomy approach confirmed the identification of two “cryptic” and one “pseudocryptic” species new for science.

## **Poster presentations**

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Benthic life in karst springs**

Pavel BERACKO, Katarína GREGUŠOVÁ, Andrea RÚFUSOVÁ, Tomáš DERKA,  
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Karst springs are considered for specific habitats in many aspects. They are characterized by a relatively stable thermal regime and high chemical stability during the year. The importance of water temperature has long been recognized, and identified as responsible for the distribution and richness of species along altitudinal and latitudinal gradients. Generally, water temperature is a key factor influencing the embryonic development, larval growth, emergence, metabolism and survival of many freshwater taxa. For their specific environmental characteristics, the karst springs are considered as refugia for many rare species of fauna and flora. The aim of this study was to characterize taxonomic composition and diversity of macroinvertebrate communities in karst springs in Western Carpathians and to determine the life history strategies within the certain species. Totally, 36 karst springs were sampled in 6 karst areas of Slovakia. The spring habitats differed in altitude and thermal regime. Based on taxonomic composition 5 significantly different macroinvertebrate assemblage groups were separated. The typical rhithral species (e.g. *Rhyacophila tristis*, *Dugesia gonocephala*, *Baetis alpinus*) identified the first group - large cave springs. Species (e.g. *Polycelis cornuta*, *Electrogena ujhelyii*, *Agapetus fuscipes*) typical for intermittent habitats formed second group. *Wormaldia occipitalis* was indicator species for seasonal springs. Small forest springs were characterized by species, e.g. *Leuctra major*, *Elmis latreillei* and *Protonemura auberti*. Neither altitude nor water temperature were detected as significant predictors of taxonomic diversity. Relatively constant water temperature throughout the year was reflected by specific life-history trajectories in certain benthic species. While some species had fixed voltinism (e.g. *Ephemerella mucronata*, *Rhithrogena semicolorata*), others showed to have flexible life-history patterns (e.g. *B. alpinus*, *Gammarus fossarum*, *Protonemura intricata*). In the species with flexible life cycle the trajectory of larval development was lead in two different ways. In the first case, the constant water temperature caused asynchronous development with cohort splitting as it was observed in *E. ujhelyii* and *Leuctra prima*. In the second case, addition of winter cohort was recorded in *G. fossarum* and *Rhithrogena picteti*. As our results indicate the high plasticity of life-history traits is one of the most important pre-adaptation attribute that allows species to live in springs and to respond specifically to the absence of temperature fluctuations in these habitats.

The research was supported by the Slovak Grant Agency VEGA project No. 1/0255/15.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Water treaders of Romania and adjacent countries and their  
phylogenetic relationships  
(Hemiptera: Heteroptera: Mesoveliidae)**

Gavril Marius BERCHI<sup>1</sup>, Petr KMENT<sup>2</sup>, Denis COPILAȘ-CIOCIANU<sup>3</sup>, László  
RÁKOSY<sup>1</sup>, Jakob DAMGAARD<sup>4</sup>,

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<sup>2</sup>Department of Entomology, National Museum, Horní Počernice, Czech Republic

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An annotated review of the Mesoveliidae (Hemiptera: Heteroptera: Gerromorpha) of the south-east European countries is provided. Biological material was collected between 2011 and 2015 in Bulgaria, Croatia, Romania and Serbia. *Mesovelia thermalis* Horváth, 1915 is recorded for the first time throughout Romania outside its type locality. We record this species for the first time from Bulgaria, Serbia and Croatia, significantly extending the south-western limits of its range. Based on proven or suspected misidentifications, *Mesovelia vittigera* Horváth, 1895 is excluded from the faunas of Romania and Moldova. However, we confirm its presence in Bulgaria by giving new records. For the first time, we analyse the phylogenetic position of *Mesovelia thermalis* within the genus using three mitochondrial and one nuclear marker and reveal that it is a sister species to *Mesovelia furcata* Mulsant & Rey, 1852. A molecular dating analysis is also given.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Small but diverse – alpine ponds as important source of genetic variability**

Zuzana ČIAMPOROVÁ-ZAŤOVIČOVÁ, Darina ŠÍPOŠOVÁ, Fedor ČIAMPOR JR

ZOOLab, Department of Geobotany, Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia

High-altitude ponds of glacial origin represent a specific category of aquatic ecosystems inhabited by unique assemblages of invertebrates. Their high environmental heterogeneity allows fauna to reach high levels of regional diversity. On the other hand, their small area, depth, and catchment area make them very sensitive to various external effects, mainly if compared to larger lakes. Albeit research interest in species diversity and ecological processes controlling these ecosystems tend to increase in last few decades, critically scarce data are available on genetic diversity of its inhabitants. Within this study, genetic variability of alpine ponds invertebrates was described. Their contribution to the overall regional genetic diversity in comparison with larger lakes was assessed, based on DNA analyses of four model species of aquatic insects with different life strategies and ecological demands. More than 100 alpine ponds (<1 ha) and 40 lakes (>1 ha) from geographically very small area of the Tatra Mts (Western Carpathians, Slovak/Polish border) were sampled and about 160-650 individuals of *Agabus bipustulatus*, *A. guttatus* (Coleoptera), *Acrophylax zerberus* (Trichoptera) and *Heterotrissocladius marcidus* (Diptera: Chironomidae) were used for molecular analyses. Genetic structure and diversity was assessed based on two mitochondrial markers (COI and CYT B). Fragments were used separately and concatenated (1124-1161bp). The analyses revealed relatively high level of genetic differentiation within larger lakes as well as small alpine ponds. The existence of unique haplotypes present exclusively in ponds was also detected. This confirmed that ponds, even small, contribute reasonably to the overall genetic diversity and that alpine aquatic ecosystems are in general important source not only of species but of genetic diversity too and should be seriously included in conservation efforts.

This study was supported by the project VEGA 2/0081/13.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**DNA barcoding caddisflies (Trichoptera) fauna in Croatia**

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DNA barcoding based on the 648-bp long segment of the mitochondrial cytochrome c oxidase subunit I (COI) gene has proven to be a highly effective method in differentiating between animal species. Although Croatia is regarded as the one of the richest European countries in terms of biodiversity, there is still no official national barcoding initiative. Caddisflies (Trichoptera), together with dragonflies (Odonata), mayflies (Ephemeroptera), stoneflies (Plecoptera) and true flies (Diptera), compose the majority of freshwater benthic macroinvertebrates. Trichoptera are one of the groups of aquatic insects that represent ideal bioindicator models. Since inhabiting freshwater exposed to all types of pollution, there is a fear that some species will become extinct before they have ever been known. Also, Croatia is a place where systematic Trichoptera surveys started just twenty years ago. DNA barcoding provides valuable tool in the laborious process of species identification of caddisflies. It helps for and accelerates delimitation of morphologically similar species and often reveals cryptic diversity. Furthermore, it facilitates associations of larval stage with adults for taxa for which morphologic diagnosis exists for only one life stage as well as species determination and adult female-male association when there is the lack of information on diagnostic characters for one of the sexes. One of the best opportunities to DNA barcode Trichoptera in Croatia appears within EU Natura 2000 Integration Project – NIP. One of the components of the project is a systematic inventory of biological diversity caddisflies. In this context, we started “DNA Barcoding the caddisflies (Trichoptera) of Croatia” as a pilot project of the future initiative “Croatian barcode of life – CROBOL”. The main goal is to DNA barcode all caddisflies species collected in the course of NIP project. So far we DNA barcoded 85 species of Trichoptera recorded for Croatia, six of them being barcoded for the first time. One of the goals is to increase the species coverage and data availability for caddisflies group by submitting data to online databases (GenBank and BOLD).



**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Aquatic macroinvertebrate assemblages of mountainous  
rivers in the Sutjeska National Park  
(Southeastern Bosnia and Herzegovina)**

Jelena ĐUKNIĆ, Bojana TUBIĆ, Vanja MARKOVIĆ, Jelena ČANAK ATLAGIĆ,  
Stefan ANĐUS, Margareta KRAČUN-KOLAREVIĆ, Momir PAUNOVIĆ

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The Sutjeska NP is the oldest national park in Bosnia and Herzegovina (BiH). Apart from caddisflies, aquatic macroinvertebrates of this region are scarcely explored. This study, performed in summer of 2015, was carried out to provide an overview of aquatic macroinvertebrate diversity and ecology. Macroinvertebrate assemblages of three mountainous rivers, the Hrčavka, the Jabušnica and the Sutjeska, were analyzed. Samples from eight localities were taken using standard FBA benthological net (multihabitat sampling procedure). During the investigation a total of 103 taxa from 16 macroinvertebrate groups were recorded. Insects belonging to orders Ephemeroptera, Plecoptera, Trichoptera and Diptera were the most diverse and abundant. Among them, mayflies *Baetis vernus* Curtis, 1834, *Baetis rhodani* Pictet, 1843, *Rhithrogena semicolorata* gr. Curtis, 1834, stonefly *Protonemura montana* Kimmins, 1941, and caddisfly *Sericostoma personatum* Kirby & Spence, 1826 were omnipresent. The study site Hrčavka 3, situated at the end of the Hrčavka Gorge, near the waterfall, was site with the highest taxa richness (50 identified taxa). This site is characterized by the significant habitat heterogeneity, which contributes to the high macroinvertebrate diversity. A few taxa considered rare for this region, including the mayfly *Epeorus jugoslavicus* Samal, 1935, and the beetle *Riolus subviolaceus* Müller, 1817 were found. The finding of caddisfly genus *Drusus* is significant since this may indicate possible presence of stenoendemites. This genus has island distribution and is known for its stenoendemites. In the region several endemic species were previously recorded.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Effect of climatic and hydrological conditions on the emergence of stoneflies (Plecoptera, Leuctridae) in an Alpine stream**

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Emergence is a key phase in the life cycle of aquatic insects. Its timing mainly depends on the local climatic and hydrological conditions. This study is a part of the “RITRODAT-project”, in which a wide range of environmental factors of the Alpine stream, the Oberer Seebach, in Lunz am See, Lower Austria was monitored for 25 years. In this work we evaluate samples of emerging stoneflies from two pyramidal traps, one of which was in the permanently submerged part of the river bed and the other one on the bed sediments, which were flooded periodically at elevated water levels. We compare the basic characteristics of emergence (timing, intensity, synchronization, sex ratio) in these two different habitats and their dependence on the actual hydrological and climatic conditions. Canonical correspondence analysis (CCA) and generalized additive models (GAM) were used for statistical analysis. From a total of 7297 individuals of 19 leuctrid species caught during 23 years we selected six species (*Leuctra albida*, *L. aurita*, *L. cingulata*, *L. hippopus*, *L. major* and *L. mortoni*) with the highest abundances. They exhibited a unimodal pattern of emergence. Emergence took place in the summer season with the exception of the spring species *Leuctra hippopus*. Uneven sex ratios in favour of females were found for the species *Leuctra albida*, *L. hippopus* and *L. major*. Leuctridae from the permanently flooded trap showed a much higher abundance (5998 individuals) but a lower species richness (17 species) compared with the periodically flooded trap, where 1299 individuals from 18 species were recorded. Seasonality (49.5 % of the explained variability), snow cover (17.6%), stream temperature (14.1%) and particular trap (11.2%) were the variables with the greatest influence on the Leuctridae species composition of emerging individuals. On the contrary, the depth contributed to the explained variability only 2.3%. Abiotic factors have a significant influence on the emergence of stoneflies.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**A literature review of the Chironomidae (Diptera) of Croatia: a platform for the first comprehensive check list of Croatian chironomids**

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Members of the Chironomidae family (Diptera) are one of the most dominant and diverse aquatic macroinvertebrate groups in all types of water bodies, and have essential role in food webs, energy flow and ecosystem functioning. Furthermore, chironomid larvae frequently represent a key group in bioassessment and monitoring programs. Therefore, thorough knowledge of the family as well as its comprehensive inventory is vital for both researchers and field limnologists. Over the last 35 years there have been many different limnological research programmes conducted in Croatia, which in some form included chironomids, however, extensive limnological research started some 15 years ago. Here, we bring the first comprehensive review of the papers dealing with the chironomid fauna, mostly as a part of aquatic communities of Croatia. Due to the character of the papers reviewed, the list is mainly based on identification of larval stages. Within different surveys, chironomids of benthic and periphytic communities of artificial and natural substrates were studied, including different habitat types at many locations in Croatia, such as big rivers (Sava, Danube), springs (Crna rijeka, Bijela rijeka), lakes (Jezero, Sakadaš) and reservoirs (Butoniga reservoir). In total, more than 120 taxa have been identified, but out of that, only 84 were identified as species, the rest includes species groups and genera. The recorded taxa are distributed in five subfamilies: Tanypodinae, Diamesinae, Prodiamesinae, Orthocladiinae, and Chironominae (tribes Chironomini and Tanytarsini). Representatives of the *Cricotopus* genus have been recorded as most abundant in several studies, followed by the members of the genera *Chironomus* and *Polypedilum*. Even though the published papers represent valuable data on chironomid diversity, ecology and comprehension of their functional role and application for nature conservation, we are aware of the incompleteness of the source data. First of all, we still miss data from national monitoring programmes that are usually not published. Moreover, previous research focused on larval stages of chironomids making reasonable species identification generally impossible. Thus, recently the attention of limnologists turned towards pupae/exuviae and adult individuals collection and identification. All the available data, together with the recent research, represent a solid platform for the preparation of the first comprehensive check list for Croatia.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Trichoptera research within project “EU Natura 2000  
Integration Project (NIP)” in Croatia**

Mladen KUČINIĆ<sup>1</sup>, Anđela ČUKUŠIĆ<sup>2</sup>, Renata ČUK<sup>3</sup>, Darko CERJANEC<sup>4</sup>,  
Ivan VUČKOVIĆ<sup>5</sup>, Petar CRNČAN<sup>6</sup>, Iva MIHOCI<sup>6</sup>, Hrvoje PLAVEC<sup>7</sup>, Ana PREVIŠIĆ<sup>1</sup>,  
Miro LANDEKA<sup>8</sup>, Ante DELIĆ<sup>9</sup>, Sanja ŽALAC<sup>10</sup>, Martina PODNAR<sup>6</sup>, Mato BUČAR<sup>9</sup>,  
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Republic of Croatia is rich in biodiversity due to specific geographical position and climate, geomorphological and hydrogeographical conditions. Unfortunately, many parts of the country are poorly investigated and no comprehensive inventory of Croatian biodiversity exists so far. Therefore, the project “EU Natura 2000 Integration Project (NIP)” has been initiated by the Ministry of Environment and Nature Protection based on the Loan Agreement with the World Bank. A systematic inventory of biological diversity of those taxonomic groups which are considered as poorly investigated is one of the components of the Project. Caddisflies (Trichoptera) is one of these groups for which a team of all available national experts was formed in order to do the field research and laboratory processing in a 2 year long period (2014-2015). Adult caddisflies were collected at 105 localities all over the country, 52 localities have been sampled in 2014 and 53 localities in 2015. Each locality was sampled three times a year (spring, summer and autumn), during the day by entomological net (sweep net) and during the night by UV light-traps with reflective canvas on pyramidal construction. More than 120 caddisfly species have been collected of which about 10 species were recorded for the first time in Croatia. Some of the interesting species found in this research were: *Rhyacophila cabrankensis*, *Rhyacophila torrentium*, *Glossosoma conformis*, *Wormaldia pulla*, *Hydroptila vectis*, *Oxyethira flavicornis*, *Tinodes antonioi*, *Drusus schmidi*, *Limnephilus graecus*, *Micropterna wagneri*, *Leptocerus tineiformis*, *Adicella cremisa*. Including these data, literature data and museum collections the number of known Trichoptera species in Croatia is around 200. One of the results of the NIP is a collection “Trichoptera – NIP”, deposited in the Croatian Natural History Museum in Zagreb.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Aquatic Coleoptera (Hydradephaga, Hydrophiloidea, Hydraenidae) and Heteroptera (Nepomorpha and Gerromorpha) fauna of Greek holiday islands (Rhodes, Crete and Corfu)**

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Although the Mediterranean Basin is considered as one of Earth's hotspot areas for biodiversity, the distributions of many species are poorly known, and a remarkable number of species are likely still undescribed. It is particularly true for the Greek islands, an area of great biogeographic interest, where a number of endemic taxa exists. The Aquatic Macroinvertebrates Research Group of University of Pécs organized collecting trips to Rhodes (2007), Crete (2008) and Corfu (2010). During the trips 237 sites were visited with the aim to study the aquatic macroinvertebrate fauna of these popular holiday islands. In this presentation we give detailed faunistical results concerning certain groups of water beetles (i.e. Hydradephaga, Hydrophiloidea, and Hydraenidae) and aquatic and semiaquatic bugs (i.e. Gerromorpha and Nepomorpha). Altogether 5322 specimens belonging to 101 Coleoptera and 30 Heteroptera species or subspecies were collected. Our results remarkably contributed to the knowledge on the distribution and, in certain cases, the taxonomy of endemic taxa (e.g. *Sigara nigrolineata mendax*, *Ilyocoris cimicoides jonicus*, *Bidessus cretensis*, *Nebrioporus amicorum*, *Laccobius cretaeus*, *Hydraena subinura*, *Hydraena rhodia*). Furthermore, one aquatic beetle (*Laccobius obscuratus orchymonti*) and three aquatic bug (*Rhagovelia infernalis africana*, *Velia mariae* and *Gerris asper*) taxa were firstly recorded from Greece.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**A comparison of collecting larvae and exuviae: which is more efficient to find rare riverine dragonfly species?**

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The commonly used „kick & sweep” method is limitedly efficient for collection of riverine dragonfly larvae in large and medium-sized rivers due to that the riparian zone can only be sampled by this method. Using dredge net to sample the deeper parts of the riverbed can be an alternative method for collecting larvae. Furthermore, collection of exuviae is widely used to study the dragonfly assemblages in different ways. In the previous years both larvae and exuviae were collected along a large (Danube) and a middle-sized (Hármas-Körös) river. In this presentation we attempt to compare the effectiveness of the different methods in detection of rare riverine dragonflies. During samplings Gomphidae were collected in relatively large number along the whole investigated river sections as exuviae, while larvae were sporadically found and, in certain cases, in surprisingly low numbers. Our results show that collection of exuviae is much more appropriate to detect rare species and to assess the size of their populations. Although this method quite time-consuming and highly affected by water level fluctuation (e.g. exuviae can be washed away during floods or by waves, and collection cannot or hardly be performed at high water levels), it does not need special sampling equipment and the exuviae can be relatively easily found along the shore. Furthermore, a large part of the river can be “sampled” since larvae climbing onto the shore could come from the whole river section. In contrast, special devices (e.g. dredge net, boat) are required for collection of larvae (making this method more expensive), and only a very little area of the bottom can be sampled with a relatively high effort, thus with a little chance to catch rare species. Accordingly, our results suggest that the distribution of the rare species and the size of their populations could be significantly underestimated on the basis of collection of larvae.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**New and rare mayfly species (Ephemeroptera: Heptageniidae)  
for the fauna of R. Macedonia**

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Total of 18 Ephemeroptera species are reported, as part of a complex hydrobiological investigation of the macroinvertebrates of spring Mala Livada and river Orevoechka Reka. Among them tree mayfly species from the Heptagenidae family are listed as new for the fauna of R. Macedonia: *Ecdyonurus macani* Thomas & Sowa, 1970, *Ecdyonurus starmachi* Sowa, 1971 and *Rhithrogena iridina* (Kolenati, 1839), extending its known distribution. Additionally, this is the second report for the rare mayflies *Rhithrogena braaschi* Jacob, 1974 and *Ecdyonurus picteti* (Meyer-Dür, 1864). Illustrated descriptions and data on the zoogeography and ecology of these species are given.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Current knowledge of the water mites (Hydrachnellae and Halacaridae) fauna of the Czech and Slovak Republics**

Jan SPACEK

Povodi Labe, statni podnik, Hradec Kralove, Czech Republic

Although water mites are a relatively large group of aquatic organisms, the identification of this group is unfortunately omitted in current monitoring programs. In the Czech Republic and Slovakia only scattered information is available about their current distribution and present status of respective taxa. On the other hand, historical information about this group on Czechoslovakian territory is relatively extensive in literature. However, it is necessary to make revision of former records and compare it with current taxa distribution using up to date identification literature and improved knowledge of species ecology. At the present more than 300 species of water mites are known from the territory of the Czech and Slovak Republic, and this contribution presents some new information about the distribution of certain species.



**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Check-list of Chironomidae (Diptera: Nematocera) in Central European ponds (Slovakia)**

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Zuzana MATUŠOVÁ<sup>2</sup>, Ladislav HAMERLÍK<sup>1</sup>

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Here we present the list of Chironomidae (Diptera) from 81 ponds in Slovakia collected during 2012–2013. The studied ponds span a wide range of geographical and ecological conditions spreading from lowlands to the mountain zone. The material was collected using a combination of the PLOCH method (for larvae) and drift sampling (to obtain pupal exuviae). A total of 126 species/taxa were identified that represent more than 30% of the overall chironomid species so far recorded in Slovakia. More than half of the taxa belonged to the Chironominae subfamily followed by Orthocladiinae (27%) and Tanypodinae (18%). The Diamesinae and Prodiamesinae were represented by one species each. The most frequent taxa were *Chironomus* spp. along with *Cricotopus (Isocladius) sylvestris*, *Endochironomus tendens* and *Polypedilum nubeculosum*. Regarding the feeding habit of the taxa, collectors prevailed (ca. 40%), but predators (ca. 25%) also represented an important part of the assemblages. As expected, most of the species/taxa were identified as pupal exuviae, since they allow higher taxonomical resolution than larvae. However, some genera were only recorded as larvae indicating the necessity of the combination of both methods for inventory research. The present project was funded by the Slovak Research and Development Agency, contract No. APVV-0059-11 and by the Slovak Scientific Grant Agency, VEGA, contract no. 2/0081/13.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Habitat characteristics of little-known species *Baetis milani*  
Godunko, Prokopov & Soldan 2004 (Ephemeroptera, Insecta)  
from the Eastern part of Black Sea Region (Turkey)**

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Hacettepe University, Science Faculty, Biology Department, Hydrobiology Section,  
Ankara, Turkey

*Baetis milani* was first described by Godunko, Prokopov & Soldan in 2004 from Crimean Peninsula (Ukraine). They clearly stated that *B. milani* belongs to subgenus *Rhodobaetis*. *Baetis milani*, which is also a member of *rhodani* species-group, was given as endemic to Crimean Peninsula in the first description. Then, it was recorded from Kapıdağ Peninsula (Marmara Sea) in Turkey in 2011. Later, larval records of *B. milani* were given as results of a comprehensive study that was conducted in the Eastern part of Black Sea Region in Turkey. In this study, habitat characteristics, such as preferences of stream zonation, substrate, altitude, current, habitat, along with physico-chemical variables range, such as temperature, dissolved oxygen, electrical conductivity, pH, PO<sub>4</sub>-P, NO<sub>2</sub>-N, NO<sub>3</sub>-N, NH<sub>4</sub>-N and SO<sub>4</sub> were given and discussed. In total, 184 *B. milani* individuals were recorded from eight collecting sites. According to the results, the species were found from hypocrenon to metarhithron parts of the streams. This species preferred oligosaprobic and beta-mesosaprobic habitats.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Are there any differences between the populations of Balkan Goldenring (*Cordulegaster heros* Theischinger, 1979) based on exuviae body dimensions? – A small scale study**

Zsófia VARGA, Bálint PERNECKER, Réka BODA, Péter MAUCHART, Arnold MÓRA,  
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The Balkan Goldenring is a charismatic species of headwater sections of hilly and mountainous streams in Central and South-eastern Europe and has a relatively small range; besides Hungary it occurs in Austria, Slovakia, Czech Republic, Italy and the Balkans. Exuviae were collected in the same period of the year from May to August in 3-6-days intervals at two sampling sites in the Mecsek Mountains, SW Hungary: Körtvélyesi-stream and Petőczy-stream for two consecutive years (2011 and 2012), and additional three years (2013, 2014, and 2015) at Petőczy-stream. For each detected exuviae the sex, the distance from the water edge and from the ground level and the substrate of emergence were recorded during the field work, while morphological parameters (head width, total body length, length of wing sheaths, length of the labium, diameter of the mentum, and length of the metafemur) were measured in the laboratory to the nearest 0.01 mm. From the two sites and five years, 316 exuviae were collected and measured. The main aims of our study were to explore whether differences can be found between populations of *Cordulegaster heros* based on body dimensions in a small geographical (two sites) and temporal scale (five years). We also hypothesized that there is a link between body size, sex, the distances travelled and/or the substrate chosen by the larvae. Our results show that female larvae are significantly larger than male ones based on all body dimensions, and also there are differences between some body size parameters of different years and sampling sites too. However, no effects of body size on emergence behaviour were detected.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Periphytic invertebrate community on artificial substrata in a floodplain lake**

Jasna VIDAKOVIĆ, Dubravka ČERBA, Ivana TURKOVIĆ ČAKALIĆ,  
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Every substrate immersed in the water will be colonized by different organisms within hours. Submerging artificial substrates enables us to monitor this process, determine the colonization and succession patterns, organisms' intersections and to evaluate the health of the aquatic ecosystem. To determine the community structure and composition of invertebrate fauna in periphyton developed on artificial substrata, plastic frame and glass slides were immersed in a lake from August 2008 to July 2009. The study was carried out in a Danube floodplain area (Lake Sakadaš, Kopački Rit Nature Park, Croatia). On 14 glass slides in total 4804 individuals, belonging to 33 invertebrate taxonomic groups, were found. Three species of Bryozoa (*Plumatella fungosa*, *Plumatella repens* and *Paludicella articulata*), as well as three species of Porifera (*Ephydatia fluviatilis*, *Ephydatia muelleri* and *Eunapius (Spongilla) fragilis*), were the main sessile colonial organisms. The recorded sponge and bryozoan species, except *Plumatella repens*, were recorded for the first time in this floodplain area. Other dominant taxa were Hydrozoa, Gastropoda, Nematoda, Oligochaeta and Chironomidae larvae. The most abundant Nematoda were *Eutobrilus nothus*, *Neotobrilus* sp. and *Chromadorina bioculata*. *Glyptotendipes pallens* agg. was the dominant chironomid larvae taxa. On the plastic frame 5385 individuals were recorded and classified into 47 taxonomic groups. High abundance was recorded for oligochaetes (*Stylaria lacustris*, *Nais barbata*, *Chaetogaster* spp., *Nais* spp., *Pristina* spp., *Specaria* sp.) (33% of total), chironomid larvae (19% of total with *Glyptotendipes pallens* agg., *Endochironomus albipennis* and *Polypedilum sordens* as the most abundant) and hydrozoan *Hydra* sp. (11% of total). Gathering collectors were the most abundant functional feeding group (54% of total), together with predators (16% of total) and filtering collectors (15% of total). Bryozoans and sponges covered the entire frame. An invasive bivalve species, *Dreissena polymorpha*, was also found on both artificial substrata. A complex three-dimensional periphyton structure and favourable feeding conditions, provided mainly by bryozoans, sponges and bivalves, were important factors for the development of diverse and abundant invertebrate community.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Spatial and seasonal variation of mayflies (Insecta, Ephemeroptera) in the Don močvar peat bog, Croatia**

Marina VILENICA<sup>1</sup>, Andreja BRIGIĆ<sup>2</sup>, Mladen KEROVEC<sup>2</sup>, Sanja GOTTSTEIN<sup>2</sup>,  
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Peat bogs are unique wetland ecosystems of high conservation value all over the world. Despite that, the data on the macroinvertebrates, including mayfly communities in these habitats are still scarce. The study was conducted in the period between March and November 2015. Mayflies were sampled together with other macroinvertebrates by rectangular net of 25 × 25 cm with a mesh size of 500 µm in various lentic habitats and a stream at the peat bog edge. In total, ten mayfly species were recorded, two of which in the peat bog lentic habitats and nine in the stream. Additionally, mayflies were completely absent from shallow lentic water bodies in the peat bog. Low species richness and abundance in the peat bog were most likely related to the harsh environmental conditions and mayfly habitat preferences. Contrary to that, higher species richness and abundance were observed in the nearby stream. Three of the recorded species, *Caenis luctuosa*, *Ephemerella karelica* and *Leptophlebia marginata* are new records for Croatian mayfly fauna. Typical life cycle patterns were confirmed for several species (e.g. *Baetis vernus*, *Nigrobaetis niger*), while for several other (e.g. *Baetis rhodani*, *Cloeon dipterum*) some discrepancies were observed. Therefore, these results provide new and valuable information on ecology of mayflies in peat bog habitats.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Distribution of the genus *Ecclisopteryx* (Insecta: Trichoptera)  
in Croatia**

Ivan VUČKOVIĆ<sup>1</sup>, Renata ČUK<sup>2</sup>, Iva VIDA KOVIĆ<sup>1</sup>, Mladen PLANTAK<sup>1</sup>,  
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The European genus *Ecclisopteryx* is currently represented by seven species and two new from Turkey. *Ecclisopteryx guttulata* (Pictet, 1834) and *E. dalecarlica* Kolenati, 1848 are widely distributed species of the genus, and are closely related to each other. The third species, which is also widespread in Europe, is *E. madida* (McLachlan, 1867). *Ecclisopteryx asterix* Malicky, 1979 and *E. malickyi* Moretti, 1991 are endemic species having limited distribution in the Alps. The last three species are morphologically well separated, while *E. dalecarlica* and *E. guttulata* are accepted as cryptic species, namely morphologically unrecognized species. The recognition of other recently described two new species, *E. keroveci* Previšić, Graf & Vitecek, 2014 and *E. ivkae* Previšić, Graf & Vitecek, 2014 from the west Balkans were based on the results of DNA sequence analysis and morphological features. These both new species are closely related to *E. dalecarlica*. Two new species of the genus *Ecclisopteryx* are described: *Ecclisopteryx oylat* sp. n. from Bursa Province in the Marmara Region and *Ecclisopteryx aksu* sp. n. from southern Turkey in Isparta Province. The Republic of Croatia extends through two ecoregions: Hungarian lowlands (ER11) and Dinaric Western Balkan (ER5), with two species of the genus *Ecclisopteryx* occurring. *Ecclisopteryx keroveci* inhabits both ecoregions, ER5 (central highlands region Lika and Gorski kotar) and ER11 the continental region between the Sava and Drava rivers, Papuk area), while the species *E. ivkae* is recorded only in ER5 (the catchment area of the Cetina River). The work presents detailed distribution of the genus *Ecclisopteryx* in Croatia.

**BIODIVERSITY & FAUNISTICS**

PS-02, TUESDAY, 5 JULY, 17:00–20:00

**Faunal features of caddisflies (Insecta, Trichoptera) in spring habitats of Dinaric karst**

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Karstic rivers represent unique habitats defined by specific physico-chemical water parameters that influence the faunal composition of those rivers. Permanent springs, particularly karstic, establish specific habitat for aquatic organisms (crenobionts and crenophiles) due to the stability of water temperature, which results in the presence of oligostenothermic species. Unfortunately, karstic rivers in Croatia are insufficiently explored regarding insect community structures. This study presents the faunal features of caddisflies (Trichoptera) fauna in spring habitats. The study includes cca 20 springs in Dinaric karst in Croatia where adult caddisflies were collected in the last two decades. Literature data of Prof. Dr. Sc. Mara MARINKOVIĆ-GOSPODNETIĆ were also taken into consideration, which comprise cca 25 karstic springs from Bosnia & Herzegovina investigated in the second half of 20th century. Preliminary results indicate that more than 120 caddisfly species occur in spring habitats of Dinaric karst area. Certain number of species is adapted to specific ecological conditions at spring habitats (crenobionts) of which some are with limited distribution restricted to only small number of springs (microendemisms). Due to the specificity of aquatic fauna in the Dinaric karst, especially in springs and upper parts of mountain streams and rivers, this area requires protection in order to prevent further degradation since these ecosystems are more sensitive to anthropogenic influence.

**COMMUNITY ECOLOGY & FOOD WEBS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**How do different metazooplankton groups (Rotifera, Cladocera, Copepoda) respond to community stress caused by flooding? A case study from Danubian floodplain Lake (Kopački rit, Nature Park)**

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Zooplankton communities play an important role in freshwater ecosystems as the biotic factor controlling the abundance of phytoplankton and linking it to organisms of higher trophic levels. According to the extended flood pulse concept, in floodplains there are three hydrological phases: isolation (I), flow pulse (II) and flood pulse (III). In the present study we evaluated the effects of flooding on metazooplankton community stress index and recovery, with emphasis on different hydrological phases. The area of Kopački rit Nature Park is regularly flooded by the River Danube and is one of the biggest floodplains in Europe. Sakadaš Lake, as the deepest lake in the floodplain, was selected as a sampling site. Samples were collected monthly, from June 2007 until December 2011 at the deepest part of the lake. Two samples at each site were collected: at the surface (20 centimetres below the surface) and the bottom (40 centimetres above the bottom). A total of 137 species of metazooplankton species was recorded with 114 species belonging to Rotifera, 15 species of Cladocera and eight species of Copepoda, all of which can be found inhabiting eutrophic waters. SIMPER analyses of total biomass showed significant differences between different hydrological phases and percentage of difference was between 78.62% and 81.15 % in surface water layers while total difference in bottom water layers ranged between 78.13% and 81.37%. ABC analyses of total zooplankton community abundance/biomass data showed the highest level of community stress during flow pulse, with value of  $W = -0,012$ . ABC analyses of planktonic crustaceans (Cladocera, Copepoda) data differed among different hydrological phases and life stages. Nauplii and copepodites showed stress in all phases ( $W(I) = -0,009$ ,  $W(II) = -0,031$ ,  $W(III) = -0,144$ ) with increase in community stress during flood pulse. Adult individuals showed no stress during isolation phase ( $W = 0,085$ ), while visible decline in stability was present during flow and flood pulse ( $W(II) = 0,011$ ,  $W(III) = -0,044$ ). Biodiversity of rotifers was the highest during small water age (<10 days) and was recorded to decrease with higher water age (>20 days), in which planktonic crustaceans repopulated. Even during the flood phase, but where water age was high, the Lake conditions resemble those of an isolated lake where biotic interactions play an important role in structuring metazooplankton community. Flow pulse, or constantly changing water level (especially short term), caused the highest stress in metazooplankton community, where only several species of Rotifera flourished and there were almost no adult individuals of planktonic crustaceans recorded. These results suggest the importance of hydrological phases in structuring metazooplankton communities in floodplain lakes, as well as the impact of water age on metazooplankton capacity to recover.



**COMMUNITY ECOLOGY & FOOD WEBS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Differences in community structure of benthic macroinvertebrates of Rječina River (SW Croatia) due to construction of dam and adjacent reservoir**

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Alterations in benthic macroinvertebrate community structure were studied at Rječina River in Croatia. Rječina is situated in Primorsko-goranska County and it is a part of Adriatic river basin. In 1968 a concrete gravity dam was built in the middle part of the river as well as the adjacent reservoir which have been used for electricity production. These events led to interruption of flow regime between upper and lower part of the river as well as to significant changes in water conditions. Due to forming of reservoir in length of about 1 km, this part of the river has changed from lotic to lentic water body type with decreased water flow downstream of the dam. In order to determine how alternations in longitude connectivity of the river influence on macroinvertebrate communities, research was conducted in April 2015 on four localities along Rječina River. Two localities were placed in upper part of the river where there is almost no disturbance and barriers in watercourse and conditions were closest to referent. One locality was placed in the reservoir and one downstream of the dam. Samples at lotic localities were collected using standard Uwitec Euro-Kick-Net according to AQEM sampling method which is based on a multi-habitat design. Sampling at the reservoir was conducted with Eckman Bottom Grab Sampler. Microhabitats that prevailed at the upper part of the river were macrolithal, mixed with mega/mesolithal. Downstream of the dam microhabitats were mesolithal and microlithal in the same ratio. Reservoir locality, due to complete change from lotic to lentic water type, had significantly different microhabitat types (POM - particulate organic matter, phytal and technolithal). In total, 43 taxa of benthic macroinvertebrates were recorded. Highest biodiversity was recorded at upstream localities (17 and 24 taxa) and the lowest at reservoir and downstream of the dam (9 and 7 taxa). Differences in microhabitat types between upper and lower localities are in correlation with differences between community structures and associated feeding types. Analysis shows that prevailed feeding types at upper localities are grazers/scrapers, gatherers/collectors and shredders. At lower stations feeding types were gatherers/collectors. Furthermore, there was significant loss of biodiversity at the reservoir and downstream of the dam, as well as lack of sensitive species, such as Ephemeroptera, Plecoptera and Trichoptera. Disturbance of watercourses causes severe changes in rivers natural habitats. All river communities are affected by these disturbances causing significant biodiversity decrease and changes in downstream communities structure and water condition deterioration.

**COMMUNITY ECOLOGY & FOOD WEBS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Seasonal dynamics of mayflies in karstic habitats in the  
Dinaric Western Balkan Region**

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Detailed information on life cycles is of a great importance as a substantial part of freshwater invertebrate ecology. Changes in diverse components of life histories of various species are increasingly used in ecological assessments as indicators of environmental stress. Seasonal dynamics of the dominant and subdominant mayfly species was studied during a one-year period in two karst freshwater ecosystems in the Dinaric Western Balkan region in Croatia: the Plitvice Lakes NP (in the continental mountainous part) and the Cetina and Ruda Rivers (in the Mediterranean part). Different types of karst habitats were encompassed in the study (springs, streams, various river sections). Life cycles of several mayfly species were in accordance with the literature data (e.g. bivoltine life cycles for *Baetis lutheri* and *Centroptilum luteolum* in Mediterranean Rivers, semivoltine for *Ephemera danica* in mountainous streams and univoltine for *Rhithrogena braaschi* in both studied ecosystems). On the other hand, in different climates and different habitats, some species showed plasticity in their life cycles between the two studied freshwater ecosystems (e.g. *Baetis rhodani* and *Serratella ignita*) or showed certain discrepancies from their typical life cycle patterns (e.g. *Baetis melanonyx* and *Caenis macrura* in Mediterranean Rivers). Results of this study provide new and valuable information on ecology of mayflies in karstic habitats.

**COMMUNITY ECOLOGY & FOOD WEBS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Primary colonization process of ciliated protozoa in a temperate floodplain lake periphyton**

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The primary colonization of artificial substrata by periphytic ciliates was studied in a Danubian floodplain lake (Lake Sakadač, Kopački Rit Nature Park, Croatia) during spring period, from April 6th to May 17th 2010. The periphyton development on glass slides started quite early, on the first day of submersion in lake water. The ciliate abundance and community composition progressively changed in the course of the exposure. The non-metric multidimensional scaling analysis indicates three phases in the ciliate colonization process. The initial phase, which includes the first three days of periphyton formation, was characterized by small motile scuticociliatids (*Cinetochilum margaritaceum* as the most abundant) and cyrtophorids, as well as the sessile peritrich species *Vorticella campanula*. The first two ciliate groups comprise of typical pioneer species, frequently found during the initial phase of colonization on the newly exposed substrates. *Vorticella* species rapidly colonize new surfaces because of the presence of a free swimming motile phase in their life cycle. During the intermediate phase of colonization (day 6 to day 12), ciliate community became more diverse, with bacterivorous *Chilodonella* species and bacterivorous-algivorous *Vorticella* species as dominant. Scuticociliatids, mostly bacterivores and algivores, were also abundant and high abundance of omnivores and predators was recorded. Sessile suspension-feeding ciliates, *Vorticella* species (bacterivores and algivores) and *Stentor roeselii* (omnivore), dominated in the late phase of colonization (day 15 to day 42). This phase was characterised by high concentration of chlorophyll a in water and increased periphyton biomass, indicating food source and habitat complexity as the most important parameters for the structuring of the ciliate community.

**CONSERVATION, MANAGEMENT & RESTORATION ECOLOGY**

PS-01, MONDAY, 4 JULY, 15:00–18:00

## **Hot news from the pearl mussel river Teplá Vltava in the Czech Republic**

Michaela ČERNÁ<sup>1</sup>, Kateřina RAMBOUSKOVÁ<sup>1</sup>, Ondřej SIMON<sup>1,2</sup>,  
Miriam JANDÁKOVÁ<sup>2</sup>, Vojtěch BARÁK<sup>1</sup>, Michal BÍLÝ<sup>1,2</sup>, Kamila TICHÁ<sup>2</sup>,  
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The Czech Republic is situated at the south-eastern margin territory of freshwater pearl mussel (*Margaritifera margaritifera*) in Europe. Current Czech population levels are estimated at only 1% of the historical abundance, and there is presently no natural reproduction on any of the remaining sites. Within the activities of an action plan, which lasts 30 years, the populations are supported with individuals from semi-natural breeding. The river basin of the Teplá Vltava River is currently considered crucial for recruitment of populations in the Czech Republic; it is located in the trans-border national parks Šumava/Bayerischer Wald (Czech Republic/Germany) and contains one of the important residual populations in central Europe near the upper altitude limit of their natural range (800 m). A complex research from last two years on adult and juvenile stages of pearl mussels in Vltava is targeted in order to identify problems with reproduction. Our detailed map of adult distribution shows low abundance (<1000 individuals in total) with typical agglomerated occurrence. An important recent success was the discovery of several subadults which had been released as part of a reintroduction in 1998. For identification of suitable habitats, we applied bioindication methods (Budensiek plates) using one-year-old juveniles in different habitats (upper, middle, and low reach of the river) and various microhabitats (above, on, and under sediments). Noticeable mortality was only observed in the hyporheic zone, where the mortality was negatively correlated with the microhabitat oxygen concentration. Water temperature was a significant factor influencing the juveniles' growth in the river's longitudinal profile increasing downstream. Mean growth reached 33% of body size over 30 days. Availability and quality of the food supply from different source were tested in the form of cultivated juvenile at the constant temperature 18 C° for 10 days. Results show that detritus is sufficient for the development. As regulated canoeing (max. 63 boats/day) at the upper reach of Vltava is permitted, the influence of that and the possibly direct damage to pearl mussels with paddles were experimentally studied. The results show that the current regulated canoeing does not significantly threaten the colonies, and that even in the case of direct collision with paddle, mussels are not seriously damaged. Our research has demonstrated that for reintroduction efforts the most suitable sites are located in the middle reach of the river in places with the most stable conditions. In the upper reach, juvenile stages are limited by low temperatures and in the lower reach by increasing eutrophication.

**CONSERVATION, MANAGEMENT & RESTORATION ECOLOGY**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**New data about distribution of *Thremma anomalum*  
McLachlan, 1876 (Insecta: Trichoptera) in Balkans**

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Momir PAUNOVIĆ<sup>3</sup>, Bojana TUBIĆ<sup>3</sup>, Nikola MARINKOVIĆ<sup>3</sup>, Jelena ČANAK ATLAGIĆ<sup>3</sup>,  
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*Thremma anomalum* McLachlan, 1876 (Insecta: Trichoptera) is subendemic caddisfly species for Balkan Peninsula, Carpathians and Caucasus. In this study we report three new finding localities for this from the Balkan Peninsula (Bosnia and Herzegovina, Bulgaria, Serbia), together with four localities already reported earlier for the territory of Republic of Macedonia. The sampling stations are located in spring regions of the Grža River (Serbia), Nišava River (Bulgaria) and in the small tributaries of the Sutjeska River (Bosnia and Herzegovina) – the Jabučnica and Hrčavka springs. Considering its rare and fragmented distribution, this caddisfly should be considered as threatened in the Balkans. New findings indicate that the species populations are in the phase of recovery (e.g. in our previous investigations it was not recorded in the Grža River), but also that there are still areas in Balkans that are not properly studied in respect to aquatic insects diversity (e.g. studies on aquatic fauna of the upper stretch of the Nišava and Sutjeska Rivers are scarce).

**CONSERVATION, MANAGEMENT & RESTORATION ECOLOGY**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Evaluation of acidification and the current ecological status  
of streams in the Czech part of Krkonose (Giant) Mts.**

Jan SPACEK

Povodi Labe, statni podnik, Hradec Kralove, Czech Republic

The Krkonose (Giant Mts.) mountain ridge on the North border of Czech Republic was greatly impacted in the second half of 20th century by acid industry emissions (predominantly sulphates from brown coal combustion in power plants). As a result of this impact, which culminates during 1970s and 1980s, whole territory of mountains was damaged by strong acidification. This effect resulted in strong changes in the communities of aquatic organisms in streams. However, a gradual recovery of aquatic communities could be observed in the current century. The present acidification status of streams was evaluated at 25 sites in 19 major catchments of the Krkonose (Giant) Mts. The methodology proposed for streams in South-West Germany was used for the evaluation. In most of the recovered streams of the impacted area an improvement of aquatic macroinvertebrate communities was documented. On the other hand the increase of trophic load in originally oligotrophic mountain habitats, which was documented on monitored sites, demonstrates rising threat for native macroinvertebrate communities and rare mountain species.

**GLOBAL CHANGES & INVASIVE SPECIES**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Usability of aquatic macroinvertebrates from bottom sediments for the bioindication of drought duration in streams**

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Hydrological regime of many smaller streams has been significantly altered which can result in a complete dry-out of their riverbed. This phenomenon, typical of Mediterranean streams, has become more frequent even in Central Europe – mainly due to progressing climate change and increasing inequality in precipitation. Both spatial and temporal extent of drying are the key factors that determine the survival of benthic invertebrates at a locality. While some of the local taxa are completely lost during the dry period, there are other taxa in the community which can resist the disturbance within the wet stream bed. Individual taxa have various life strategies and qualities (species traits) which could either help them to resist the drought, or which on the contrary impede their survival ability. These differences between taxa, or their dying rate, are the precondition for the possible indication of stream desiccation period using benthic invertebrates as bioindicators. Key factors affecting the survival of benthic invertebrates in a dry riverbed (i.e. specific species traits and abiotic factors such as sediment moisture or temperature) were investigated based on the analysis of samples collected within the BIODROUGHT project ([www.biodrought.eu](http://www.biodrought.eu), TA02020395) and experimental data. The focus was on the presence or absence of single taxa and the changes in dried-up stream bed community structure. The obtained data serve as a background for the development of a method for the estimation of the duration of stream dry period.

**GLOBAL CHANGES & INVASIVE SPECIES**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Risk assessment of drying up of small streams in the Czech Republic**

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Michal STRAKA<sup>3</sup>, Denisa NĚMEJCOVÁ<sup>1</sup>, Marek POLÁŠEK<sup>1,2</sup>, Pavel ONDRÁČEK<sup>4</sup>

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Categorization of the Czech Republic territory in terms of the risk of drying up of small streams (1st to 4th order by Strahler) was proposed. Three levels of risk (low, medium and high) were set for basic hydrological units (catchments). The risk levels were defined using selected abiotic characteristics of the hydrological units and their combinations. The selection of characteristics and their limit values were derived using a statistical method of classification trees. A set of sites divided into groups depending on whether they had been found drying or not was evaluated. The drying up of streams was detected by a new method of retrospective bioindication. This new method, which is based on the analysis of benthic macroinvertebrates, was developed within the comprehensive research of both permanent and drying up streams from 2012 to 2015. A total of 332 sites (1362 samples) located at small streams and monitored in the Czech Republic from 1997 to 2015 were evaluated by this method. The risk level was derived from the following characteristics: the precipitation deficit, land cover type, the share of bedrock containing clays, geomorphological characteristics and the share of standing waters in the catchment. According to our assessment the area of low risk of drying up of streams up to 4th Strahler order represents 45.3% of the area of the Czech Republic, while the area of medium and high risk 23.3% and 31.3% respectively. Typical high risk catchments are those with the predominance of arable land and with the share of standing water bodies greater than 1‰. The proposed categorization is to serve as a basis for decision-making processes, particularly for the water resource management, agriculture and conservation, and for the evaluation of the effect of measures against drought impacts. The categorization was based on the results of BIODROUGHT project ([www.biodrought.eu](http://www.biodrought.eu)).



**GLOBAL CHANGES & INVASIVE SPECIES**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Biocontamination of benthic macroinvertebrate communities  
of four major large rivers in Croatia**

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Rapid spread of alien and invasive macroinvertebrates across European freshwaters during the last hundred years has caused dramatic changes in structure and function of macroinvertebrate communities, especially in large rivers. Biocontamination of macroinvertebrate communities of Croatian large rivers has been sparsely studied. The aims of this study were to assess the most recent (2015) biocontamination level of macroinvertebrate communities along all four major large rivers in Croatia (Danube, Sava, Drava and Mura) and to establish temporal changes of biocontamination by comparison of our results with previous study. Twenty quantitative samples of 0.0625 m<sup>2</sup> in a shallow bank area were collected once in 2015 at 46 sites along the Croatian sections of Danube, Sava, Drava and Mura Rivers using hand nets (mesh size 500 µm). Danube has the highest number of invasive species while Sava and Drava have subset of Danube alien species. The whole Mura River and the most upstream reaches of Drava and Sava in Croatia have not yet been heavily colonized by invasive invertebrates. Sava has been heavily invaded up to ~640 km from the mouth and the main course of Drava up to the last reservoir Donja Dubrava (~250 km from the mouth). The most dominant and widespread invasive species are amphipods *Dikerogammarus villosus*, *D. haemobaphes* and two *Chelicorophium* species, and clams *Dreissena polymorpha* and *Corbicula fluminea*. Middle parts of both Sava and Drava have the highest biocontamination level mainly due to high abundance of *Chelicorophium* spp. and invasive gammarids. Biocontamination levels are mostly stable in Danube and long-time colonized lower and middle parts of Sava and Drava. However, increasing biocontamination levels have been observed in the upstream reaches of Sava and Drava, mostly at the fronts of upstream spreading of invasive gammarids (*D. villosus* in Drava and *D. haemobaphes* in Sava). Continuous monitoring of the most invasive species spread and assessment of their impact on macroinvertebrate communities are essential prerequisite for better understanding of the changing ecological state of large rivers.

**HUMAN IMPACT, WATER POLLUTION & TOXINS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Assessment of allelopathic aquatic plants: evaluating genotoxic effect using the mussel micronucleus test**

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Several aquatic plants have been generally known to release allelochemicals that affect other plants or bacterial species, gaining an advantage in competition. The plant extracts are usually tested on algae without isolating the active compounds that caused the allelopathic effect. Though it is still not clear which are the active ingredients, polyphenols and tannin have proven allelopathic capacity and are considered widely distributed. These compounds play a role not only in competitive interactions but have been shown to exert geno- and cytotoxicological effect on other elements of the aquatic ecosystem. In this study genotoxic potential of *Ceratophyllum demersum* L. (hornwort, family Ceratophyllaceae), *Iris pseudacorus* L. (yellow flag, family Iridaceae), *Typha angustifolia* L. (narrowleaf cattail, family Typhaceae), *Stratiodes aloides* L. (water soldier, family Butomaceae), *Oenanthe aquatica* (L.) Poir (water dropwort, family Umbelliferae) and *Lythrum salicaria* (L.) (purple loosestrife, family Lythraceae) was assessed using the mussel micronucleus test. In parallel, we determined the total and hydrolysable tannin contents. All plant extracts showed significant mutagenic effect, but this effect could not be explained by the presence of these compounds alone. Most possibly there are other bioactive compounds that might be also responsible for the ecological effect.

**HUMAN IMPACT, WATER POLLUTION & TOXINS**

PS-01, MONDAY, 4 JULY, 15:00-18:00

**Influence of physicochemical characteristics of habitats on  
distribution of Simuliidae (Insecta: Diptera) species in  
Mediterranean climate running waters**

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Fauna of Mediterranean aquatic ecosystems are remarkably affected by land use change, pollution, morphological degradation and global climate change in Turkey. The biomonitoring of water and habitat quality of aquatic ecosystem is obligatory for their conservation. Benthic macroinvertebrates are widely used in assessments of ecological quality of aquatic ecosystems. Simuliidae species are an important component of benthic macroinvertebrates for biomonitoring of freshwater habitats, because their larvae and pupae are sensitive to habitat degradation. The current study investigated the influence of environmental variables on community composition of Simuliidae species in Mediterranean climate running waters. For this purpose, 15 species recorded from 18 collecting sites have been analyzed by use of multivariate analysis. Sampling was carried out monthly from Köyceğiz-Dalyan protected area between April 1992 and April 1993 and from Büyük Menderes River between April 1998 and January 1999. The environmental variables explaining community composition were listed according to the degree of their importance. These variables were  $SO_4 > DO > pH > EC > PO_4-P > Temp > NH_4-N > NO_2-N > NO_3-N$ . While the abundance of *Simulium (Simulium) variegatum*, *Simulium (Simulium) trifasciatum* and *Simulium (Simulium) ornatum* were positively correlated with water temperature, pH,  $NO_3-N$  and  $SO_4$ , the abundance of *Simulium (Eusimulium) velutinum*, *Simulium (Wilhelmia) balcanicum*, *Simulium (Eusimulium) angustipes* and *Metacnephia lyra* were positively correlated with  $PO_4-P$ ,  $NH_4-N$  and EC. While the abundance of *Simulium (Simulium) morsitans* and *Simulium (Simulium) posticatum* were closely correlated with  $SO_4$ , the abundance of *Simulium (Nevermannia) angustitarse* were positively correlated with DO. According to TWINSPAN analysis collecting sites composed of seven groups with seven indicator species.

**HUMAN IMPACT, WATER POLLUTION & TOXINS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**How different taxonomic groups within macroinvertebrate community influence the strength of taxonomic distinctness index in lotic systems**

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Macroinvertebrates present one of the most frequently used groups of aquatic biota in the routine monitoring programs of freshwater ecosystems. Besides well-known advantages of this group, identification process of less known groups (e.g. family Chironomidae) presents the main obstacle in their complete inclusion in bioassessment programs. The main objective in this study was to test how different taxonomic groups, presented by taxonomic distinctness index ( $\Delta+$ ), respond to the degradation gradient of the Southern Morava river basin, Serbia. Funnel plots with 95% confidence limits for  $\Delta+$  were constructed for macroinvertebrates in total, as well as for the three separate taxonomic groups (family Chironomidae, Ephemeroptera-Plecoptera-Trichoptera (EPT) group and macroinvertebrates without family Chironomidae). The funnel plot based on all macroinvertebrates data revealed that all sampling sites a priori defined as reference sites, were distributed within the 95% confidence limits. On the other hand 59% of degraded sampling sites fell outside the lower confidence limits. When separate taxonomic groups were tested, the tendency of discrimination between reference and degraded sites were clearly visible but without sampling sites falling out of the 95% confidence limit. The method of funnel plots with 95% confidence limit, based on the taxonomic distinctness index, could be proposed as a suitable technique for bioassessment only when all groups of macroinvertebrates are included in the analysis. On the other side, when separate groups are used for the construction of the funnel plots, the discriminatory power is diminished, remaining concordant with the degradation gradient.

**Intraspecific variability in fecundity of *Leptophlebia vespertina* (Ephemeroptera: Leptophlebiidae) in seven acidified lakes in the Bohemian Forest**

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Although fecundity (number of eggs per female) is known in many species of mayflies, the knowledge of factors influencing mayfly fecundity remains fragmentary. As fecundity of mayflies is strongly positively correlated with the body size of mature larvae, factors influencing larval body size (particularly temperature, food, water pollution, and predator pressure) have been suggested to explain also fecundity. There are only few studies describing the effect of acidification on the body size and fecundity of mayflies. The main aim of this study is to describe the variability of larval body size and fecundity in acid tolerant mayfly *Leptophlebia vespertina* inhabiting acidified lakes in the Bohemian Forest. This region suffered from high atmospheric pollution from the 1950s to the late 1980s, but has since been recovering from acidification due to decrease in sulphur and nitrogen deposition in the 1990-2000s. Mature larvae of *L. vespertina* were collected in seven glacial lakes, four chronically acidified lakes with pH 4.5–5.5 and negative alkalinity, and three recovering lakes with pH 5.6–6.2 and positive alkalinity. Body size of larvae, number of eggs per female and egg size were measured using an image analysis. Preliminary results showed relatively high variability in both body size and fecundity among lakes and indicated the adverse effect of low acidity in strongly acidified lakes. Body size and fecundity of mayflies in recovering lakes could be influenced by other factors, such as the presence of fish.

**PALEOLIMNOLOGY**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Subfossil chironomid communities (Diptera: Chironomidae)  
from sediments of lake Popradské pleso indicate climatic  
oscillations in the last millenium**

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Sediments of lakes situated above the tree line are important traps of biotic and abiotic interaction in the past, with great information potential to determine climate induced changes in the integrated system of lake–catchment. These ecosystems respond significantly to even very small changes, what is usually not the case of ecosystems situated at lower elevations. Thus, sediments of high altitude lakes represent valuable archives for paleoecological studies. The main objective of the paleolimnological research of lake Popradské pleso sediments was the identification of natural and anthropogenic key factors, which influenced the lake and its surroundings during the Holocene. The first step of the research brought evidence about the influence of eutrophication caused by increasing touristic activities in the lake surroundings during the most recent history of the lake. The second step of the research is focusing on the analysis of a ~35 cm long sediment sequence representing the last millennium including one of the most important climate changes of the Holocen – the Little Ice Age. To track past environmental changes, chironomid head capsules along with sediment organic content were used as proxies. A total of 3,978 head capsules identified as 37 taxa from five subfamilies were analysed in all sediment layers. The dominant taxa were *Tanytarsus lugens*-type, *Heterotrissocladius marcidus*-type and *Psectrocladius sordidellus*-type in the whole stratigraphic segment. The low content of organic content, indicating small lake productivity, caused by cold time periods, is indicated by high percentage of rheophilic and oligosternothermal taxa. The paleolimnological research of Popradské pleso lake was supported by grant schemes VEGA 1/0180/12 and VEGA 1/0664/15.

**POPULATION ECOLOGY**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Is it better to be big and old or small and young to overcome drought? – a case study of *Gammarus fossarum* after-drought recolonization of intermittent streams**

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The ongoing climate change affects the flow regime especially of small brooks and is probably related to more frequent extreme droughts, which impact populations of aquatic organisms. An example of strongly affected species is amphipod *Gammarus fossarum* that inhabits majority of small streams in the Czech Republic. We compared *Gammarus* populations from 5 pairs of permanent and intermittent sites with similar abiotic characteristics, to find out how were the population structures impacted by previous drought. The populations of gammarids were sampled in autumn after two months of recolonization, and the length of the head (from the upper edge of the head to the base of second antenna) was measured using the image analysis and later recalculated to body length. Intermittent sites had (i) lower after-drought abundance, (ii) predominance of males over females and (iii) fewer juveniles than permanent streams. Among each pair of sites (intermittent/permanent), there were also significant differences in the size structure of the populations. Smaller individuals were more abundant at permanent sites, while bigger individuals (mostly males) dominated at intermittent ones. Considering these results, we hypothesize that in studied streams permanent reaches (where adult specimens can survive drought) are more important sources for recolonization than small interstitial spaces (that are used mostly by juveniles). The differences in the structure of *Gammarus fossarum* populations at permanent and intermittent sites were noticeable even two months after reflooding, which indicate that used population characteristics have the potential for bioindication of the latest drought.

**WATER QUALITY MONITORING & METRICS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Evaluation of Plecoptera (Insecta) community composition  
using multivariate technics in a biodiversity hotspot**

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Eastern Black Sea is a subcoregion of the Caucasus Ecoregion and its Plecoptera fauna is similar to the fauna of Caucasus with unique endemic species of the region. The Caucasus Ecoregion is one of the “WWF Global 200 Ecoregions” and it is also included in the list of top 25 hotspots in the World. Running water ecosystems of Eastern Black Sea subcoregion are most sensitive to land use change and global climate change. High altitude aquatic ecosystems are strongly threatened by global climate change in the region. Plecoptera constitute the most important part of the biodiversity of running waters in the region. Among the benthic macroinvertebrate taxa, the Plecoptera is the best indicator of ecological conditions of running waters. The influence of environmental variables on the distribution of twenty Plecoptera species in running water ecosystems (headwaters, crenon, epirhithron, metarhithron) were assessed using canonical correspondence analysis (CCA). Sampling was carried out in 2009 and 2011. Eleven end groups were generated from the TWINSpan analysis. *Isoperla rhododendri*, *Isoperla grammatica*, *Protonemura bifida*, *Protonemura eumontana* and *Perla caucasica* were closely related to pH, dissolved oxygen and riparian vegetation. *Brachyptera transcaucasica transcaucasica*, *Nemoura martynovia*, *Nemoura taurica* and *Protonemura eumontana* were related to Mg and Cu. The results show that the Plecoptera assemblage composition was effected by DO, pH, EC, temperature, nitrite, Ca, Mg, Fe, Cu, Zn, Al, riparian vegetation, altitude and stream width.



**WATER QUALITY MONITORING & METRICS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**How different impacts affect benthic macroinvertebrate communities in the same water body type – case study for the upper course of Lonja River (NW Croatia)**

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According to WFD (2000/60/EC) ecological state of rivers can be estimated using biological parameters, including benthic macroinvertebrates. Each water body type has type-specific biological reference conditions which are used to assess the ecological state. Anthropogenic pressures, such as pollution and changes in hydromorphology, can lead to alteration in macroinvertebrate communities and consequently have impact on the ecological state of river. Benthic macroinvertebrates were sampled on two stations (B - upstream and M - downstream) in the upper course of Lonja River during May and October 2012. Sampling was conducted according to AQEM protocol and ecological state of water was assessed. Investigated parts of the river were placed on a distance of around 6 km and characterized as surface water body type 2a (lowland small river on clay-sandy substrate) in Pannonian limno-region. Station B is partially channelized and undergoes near houses and crops which causes increased input of nutrients. River beds are covered with woody vegetation and there are visible traces of beaver activities. The presence of beavers led to formation of lentic parts where river is much slower and deeper, and habitats that prevail are silt, xylal and POM. Station M recently has been channelized and woody vegetation is completely absent. Water level is much lower (around 0.5 m) but the flow is faster and the bottom is covered with aquatic vegetation. Prevalent habitats are sand, gravel, silt and phytal. Hydromorphological differences between stations resulted with differences in physical-chemical parameters as well. River continuum concept indicates that downstream station M should have more homogenized substrate, lower flow and oxygen levels and consequently lower biodiversity. But research results showed the opposite. Station M had significantly higher biodiversity (34 taxa in May, 25 in October) than B station (20 taxa in May, 17 in October), as well as much higher abundance. Aquatic vegetation at station M created specific conditions with slower water flow and finest substrate within the plants that enabled population of species such as Gastropoda and Odonata. On the other hand, lentic conditions made by beavers, lot of shadow and increased input of nutrients changed the type of substrate at station B. Consequently there is decreased source of food for macroinvertebrates and lower oxygen level at this station, which favored groups that are tolerant on organic pollution (Oligochaeta and Chironomidae had the highest abundance and number of taxa), but also led to decreased biodiversity. Water quality assessment showed that station B has poor to very bad state, while station M, despite higher biodiversity, also had poor state. The reason is lower number or absence of sensitive species, such as Plecoptera, Ephemeroptera and Trichoptera, and increased number of pollution tolerant species such as Oligochaeta and Chironomidae.

**WATER QUALITY MONITORING & METRICS**

PS-01, MONDAY, 4 JULY, 15:00–18:00

**Ecological status of three reservoirs in sub-urban area of Belgrade (Serbia) based on macroinvertebrate assemblages**

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The aim of this study was to assess the ecological status of three reservoirs situated in sub-urban area of Belgrade (the Bela Reka in Ripanj, the Pariguz in Resnik and the Duboki Potok in Barajevo), based on macroinvertebrate assemblages. All reservoirs are under high anthropogenic influence, such as communal waste water discharges from surrounding settlements, fishing and other recreational activities. Previous investigations of macroinvertebrate assemblages from these reservoirs were carried out in 2012. For the ecological status assessment following indices were used: Total number of taxa, Diversity Index (H'), Saprobic Index (SI), Biological Monitoring Working Party (BMWP) and Average Score Per Taxon (ASPT). Samples were collected during August 2015, using hand net with mesh diameter 500 µm (multihabitat sampling procedure). Majority of organisms were identified to species level. Among 40 taxa recorded in total, indicators of moderate organic pressure ( $\beta$ -mesosaprobic species) were the most dominant. The Duboki Potok Reservoir was the site with the highest number of recorded taxa (23), and the highest diversity (2.13), followed by the Bela Reka with 18 taxa and diversity index of 1.69 and the Pariguz with 13 taxa identified and diversity index of 1.62. Diptera was the dominant taxa group at all sampling sites in respect to both abundance and diversity. The values of SI indices were similar at all localities: the Duboki Potok and the Bela Reka (2.31) and the Pariguz (2.45). BMWP Score varied from 33 at the Duboki Potok to 89 at the Bela Reka while ASPT value ranged from 4.1 at the Duboki Potok to 5.0 at the Pariguz. Overall, ecological status in reservoirs was significantly improved in comparison to results from 2012. In 2012 the ecological status of the reservoirs was generally poor (class IV), while in 2015 results showed significant improvement (class II) based on the analysis of benthic macroinvertebrate assemblages.



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