Department of Biology and Ecology, Faculty of Natural Sciences,
Matej Bel University in Banská Bystrica
&
The Slovak Limnological Society

THE 10th CENTRAL EUROPEAN DIPTEROLOGICAL CONFERENCE

Conference Abstracts

Tímea Chamutiová & Ladislav Hamerlík (eds.)

Kežmarské Žľaby, 23rd– 25th September, 2019

The 10th Central European Dipterological Conference

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Venue:

Kežmarské Žľaby

Vysoké Tatry, Slovakia

Date:

23rd – 25th September, 2019

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Dear Dipterists, Colleagues & Friends

Welcome to the 10th Central European Dipterological Conference held in Kežmarské Žľaby, High Tatra Mountains, Slovakia!

This year the CEDC is exceptional, since it is exactly a half-century since the foundation of informal but regular meetings of Czech and Slovak dipterists. These local triennial meetings have over the last decades transformed into an international conference with an influence beyond the borders of Bohemia, Moravia and Slovakia and linking diptersists from all over Europe.
The goal of the conference is to gather dipterists not only from Czech Republic and Slovakia but also the neighbouring European countries to present the results of their work, share their knowledge and experience, and spend pleasant moments together. It is also an opportunity to commemorate and celebrate the extraordinary anniversary of the meeting of exceptional people specializing in a remarkable group of insects – the Diptera.

We wish you a fruitful and memorable time in Kežmarské Žľaby!

On behalf of the organizing committee,

Peter Bitušík 

This conference is being held under the auspices of **Assoc. Prof. Jarmila Kmeťová, PhD.**, the Dean of the Faculty of Natural Sciences, UMB
and
Ing. Ján Mokoš, the major of town Vysoké Tatry

Our thanks for support belong to our sponsors:

CONFERENCE PROGRAM

Sunday, 22. 09. 2019

16.00 – 22.00: Registration

18.00: Dinner

Monday, 23. 09. 2019

09.00–10.30: Registration
11.00–11.30: Opening ceremony
11.30–12.00: Jedlička L.: Half a century of dipterological meetings – looking back

12.00–13.30: Lunch

Oral presentations: ***Phylogeny, evolution, taxonomy***
Chairman: Andrea Tóthová
13.30–13.45: Krzemiński W., Krzemińska E., Skibińska K., Kopeć K. & Soszyńska-Maj A.: How the wing venation pattern has evolved in selected groups of Diptera? Fossils – key to Diptera phylogeny
13.45–14.00: Starý M. & Tóthová A.: A new perspective on phylogeny of the subfamily Limnophilinae (Limoniidae: Diptera)
14.00–14.15: Zatwarnicki T.: Phylogeny of the tribe Atissini (Diptera: Ephydridae)
14.15–14.30: Ševčík J.: DNA barcoding of the Czech and Slovak gall midges (Diptera: Cecidomyiidae): Beginning of a long journey
14.30–14.45: Kúdelová T., Kúdela M., Bujačková B. & Adler P.H.: DNA barcoding as an identification tool for black flies

14.45–15.15: Coffee break

Oral presentations: ***Miscellaneous***
Chairman: Jan Ševčík
15.15–15.30: Kubík Š: How can frit flies also look (Diptera, Chloropidae)
15.30–15.45: Goffová K., Krčmárik S., Matisková D., Krajanová V. & Bohuš M.: Diptera in diet of the European Bee-eater (*Merops apiaster*) in Southern Slovakia
15.45–16.00: Heřman P.: Diptera as non-target insects in light traps
16.00–16.15: Jalili N.A. & Konderla B.: Occurrence of mosquitoes in the capital of Slovakia, Bratislava, between 2017 – 2019 and measures to reduce their abundance

16.15–16.45: Coffee break

Lecture before dinner
16.45–17.15: Kubík Š: Insects, respectively flies as part of historical advertising (matchbox labels)

18.00: Dinner

Tuesday, 24. 09. 2019

Oral presentations: ***Biogeography, Diversity & Conservation Biology***
Chairman: László Papp
09.00–09.15: Starý J. & Oboňa J: To the knowledge of biodiversity of selected fly families (Diptera) of Transcaucasia, with special emphasis on the families Limoniidae and Pediciidae
09.15–09.30: Boardman P.: 46 years of the UK Cranefly Recording Scheme
09.30–09.45: Ševčík J.: Bibionomorpha of Taiwan: A mixture of tropical and montane elements
09.45–10.00: Barták M.: Efficient Diptera inventory in light of unprecedented biodiversity loss

10.00–10.30: Coffee break

Oral presentations: ***Biogeography, Diversity & Conservation Biology***
Chairman: Miroslav Barták
10.30–10.45: Papp L. & Černý M.: Agromyzidae (Diptera) of Hungary – a project successfully accomplished
10.45–11.00: Tkoč M., Roháček J., Ševčík J. & Preisler J: Diptera diversity of Muránská planina and Cerová vrchovina (Slovakia): the current state of investigation and possibilities of cooperation
11.00–11.15: Móra A., Gadawski P., Rewicz T., Calleja E. & Csabai Z.: Chironomidae (Diptera) of Malta: first records from the driest country of Europe
11.15–11.30: Čerba D., Koh M., Brigić A., Gottstein S. & Mihaljević Z.: "Every bog's a castle" – a summary of chironomid diversity in specific microhabitats of a Balkan peatland

11.30–12.00: Photo session

12.00–13.30: Lunch

Oral presentations: ***Biogeography, Diversity & Conservation Biology***
Chairman: Dubravka Čerba
13.30–13.45: Kúdela M., Kúdelová T., Adler P.H. & Romero R.O.: Black fly fauna of Spain
13.45–14.00: Boardman P.: Live at the fly Olympics
14.00–14.15: Vlk R. About a new tephritid fruit fly species (Diptera, Tephritidae) in the Czech Republic

14.15–14.45: Coffee break

Oral presentations: ***Dead Diptera***
Chairman: Ladislav Hamerlík
14.45–15.00: Baranov V. &. Haug J.T. What flies larvae in the fossil records can do for dipterology
15.00–15.15: Štillová V., Hamerlík L., Přidalová M., Chamutiová T., Čerba D. & Bitušík P.: Influence of fish introduction on subfossil Chironomidae in a mountain lake (Vyšné Račkovo pleso, Tatra Mts.)
15.15–15.30: Chamutiová T., Hamerlík L., Pipík R. & Bitušík P.: Subfossil chironomid assemblages in Batizovské pleso (the High Tatra Mts, Slovakia) as indicators of environmental changes during the early Holocene deglaciation
15.30–15.45: Skibińska K., Krzemiński W. & Kopeć K.: New Bruchomyiinae in Baltic amber
15.45–16.00: Kopeć K., Krzemiński W., Skibińska K. & Soszyńska-Maj A.: The diversity of the fossil genus *Mesotipula* in Asia
16.15–16.30: Roháček J.: Another acalyptrate fly (Diptera) from the Eocene Baltic amber of unknown family affiliation?

17.00: Transfer to conference dinner in Ždiar village

Wednesday, 25. 09. 2019

Oral presentation: ***Ecology of Diptera***
Chairman: Vít Syrovátka

09.00–09.15: Ivković M.: A decade of aquatic Diptera emergence studies, with emphasis on the Empididae

09.15–09.30: Dashinov D. & Kenderov L.: Species composition and distribution of the Chironomidae (Diptera) from the rivers and groundwater of Central Balkan National Park, Bulgaria

09.30–09.45: Dorić V., Ivković M. & Mihaljević Z.: Littoral Chironomidae assemblages of Dinaric karstic lakes

09.45–10.00: Laug A., Turner F., Wang J., Engels S., Zhu L., Mäusbacher R. & Schwalb A.: Sixteen-meter water depth: A chironomid distribution boundary independent of environmental conditions?

10.00–10.30: Coffee break

Oral presentation: ***Ecology of Diptera***
Chairman: Peter Bitušík

10.30–10.45: Ergović V., Koh M. & Čerba D.: Longitudinal distribution and diversity of macrozoobenthos community in a Pannonian mountain stream network

10.45–11.00: Koh M. & Čerba D.: Feeding habits of the predatory *Monopelopia tenuicalcar* (Kieffer, 1918) in an ephemeral epiphyton community

11.00–11.15: Syrovátka V., Bojková J. & Horsák M.: Larvae of aquatic Diptera as predators and prey: some examples of predator-prey interactions

11.15–11.45: Conference closing ceremony

12.00: Lunch

Posters

Kasičová Z., Komorová P., Dražovská M., Koleničová S. & Kočišová A.: How to choose correctly methods of identification of parasite pathogens in *Culicoides*

Gorban I. & Podėnienė V.: Nematoceran (Diptera) biodiversity in dead wood in Būda Botanical-Zoological Reserve in Kaišiadorys (Lithuania)

Popović N., Čerba D., Raković M. Tomović J., Atanacković A., Marinković N., Ilić M., Andjus S., Đuknić J., Čanak Atlagić J., Smiljanić P. & Paunović M.: Non-biting midges (Chironomidae) from artificial water bodies in Belgrade sub-urban area

Đuknić J., Čanak Atlagić J., Andjus S., Paunović M., Živić I. & Popović N.: Phylogeny of *Simulium reptans* (Linnaeus, 1758) and *Simulium reptantoides* Carlsson, 1962 – insights from Balkan populations

Oboňa J., Starý J., Ježek J., Dvořák L., Máca J., Negrobov O.P., van der Weele R., Manko P. & Svitok M.: The springs – little-known habitats of flies (Diptera) with high conservation value

Pannes A., Laug A., Turner F., Engels S., Wang J., Haberzettl T., Liping Z., Mäusbacher R. & Schwalb A.: Subdivision of the subfossil chironomid larvae *Micropsectra radialis*-type on the Tibetan-Plateau

Rettich F., Rudolf I., Betášová L., Šikutová S. & Imrichová K.: Surveillance of mosquitoes (Diptera, Culicidae) in South Bohemia (Czech Republic)

Roháček J., Tóthová A. & Dušátková L.: How time flies with anthomyzid flies…

Ziegler J. & Tóthová A.: An unexpected high diversity of the Old World rhinophorid genus *Stevenia* (Diptera, Rhinophoridae)

ABSTRACTS

What flies larvae in the fossil records can do for dipterology

Viktor Baranov[1], Joachim T. Haug[1,2]

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Key words: Diptera, larva, pupa, fossil, ontogeny, amber

Geological history of the flies and midges (Diptera) spans over 200 million years, starting in the Late Triassic. Since the dawn of palaeoentomology in the late 18th century, we made considerable progress, in understanding modes of evolution and diversification of the flies. Yet, despite all the progress made, one major hindrance remains in the development of the modern palaeodipterology - almost universal lack of the worker's interest in the fossil Diptera larvae. With the majority of the of the alpha-taxonomy being based on the adult flies, fossil larvae getting very little attention, as new taxa description still often seen as the main engine of the career progression in some subfields of the paleontology. Taking into account that most of the Diptera are spending the majority of their life and performing most of their ecological functions as larvae, such an approach looks shortsighted at best. In this talk, we aim to showcase unique value of studying of Diptera larvae (and pupae) from the fossil records for better understanding of the flies' evolution, diversification mechanisms, palaeoecological role and, most importantly ecology and systematics of the modern Diptera. We will deal with cases of the evolution of the ontogenetic sequences based on the fossil material, measuring relative rates of growth in fossil larvae, and reconstructing palaeoenvironments using fossil immatures of Diptera.

Efficient Diptera inventory in light of unprecedented biodiversity loss

Miroslav Barták

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Key words: methods, biomonitoring, collecting, preparation, morphospecies

Many recent studies show that we are living in an epoch of an unprecedented loss of biodiversity. Biodiversity is considered to be the most important natural resource and also guarantees the functioning of two most important processes, which are responsible for the dynamic stability of natural processes: plant defense mechanisms and bioregulatory complex. According to many estimates, about half to a third of the species inhabiting this planet are described today, and it is still unclear whether speciation processes can offset biodiversity loss. All species have important ecological functions, of which we know very little, and even less we know how the disappearance of species (due to climate change, land use changes, etc.) will affect the disturbances of these functions. The role of taxonomists should therefore be to preserve species in at least descriptions and collections. Unfortunately, such activities are not supported by either "top" magazines or grant agencies. Therefore, we have developed a methodology for effective biomonitoring and inventorying of a significant group, two-winged insects (today it comprises about 1/8 to 1/9 of all described animal species). The method consists of the following steps: 1) collecting in the field using a combination of: sweeping, colored dishes and Malaise traps, 2) after the end of the daily collection, all samples are taken and unwanted elements are removed (which could damage the samples or unnecessarily increase material volume - as plant residues, large insects etc.), 3) preservation of samples in wide-necked PET bottles ideally in ethyl alcohol (for possible later DNA analysis, 70% concentration is ideal for dry preparation), 4) transport of material in PET bottles without air bubbles, 5) processing of samples in the laboratory. Sample processing involves sieving through a sieve about 4 mm mesh; selected individuals are prepared dry by formalin-acetate method or left in alcohol for DNA analysis.

46 years of the UK Cranefly Recording Scheme

Pete Boardman

Natural England Natural England Mail Hub, Natural England, Worcester County Hall, Spetchley Road, Worcester, WR5 2NP. Pete.Boardman@naturalengland.org.uk

The UK Cranefly Recording Scheme is the oldest fly recording scheme in the United Kingdom, being active since February 1973. It was set up by Dr. Alan Stubbs, and the Biological Records Centre (BRC) and covers the flies within the Tipuloidea & Ptychopteridae. Alan subsequently collaborated with many other dipterists within including Mr. John Kramer (current newsletter editor and scheme co-organiser), and the author (current scheme recorder and scheme co-organiser) to produce a modern recording scheme, regular newsletters for cranefly recorders, atlases of the Ptychopteridae and genus *Tipula*, accessible keys to all UK Craneflies, phantom craneflies, and Trichopteridae (winter gnats), and a book (British Craneflies) that will tackle the ecology and identification of all British craneflies is in the latter stages of publication. The recording scheme is active on social media (@CRSTipula on Twitter) and runs training events each year. Records are collected using direct submissions and i-Record biological recording software, which enables observers to submit data and photographs to back up their records. An approximate combined figure of the i-Record and BRC databases suggests the Scheme holds close to a quarter of a million records. As we approach our 50th year we are hoping British Craneflies will boost further interest and recording of this fascinating group of flies.

Live at the fly Olympics

Pete Boardman

Natural England Natural England Mail Hub, Natural England, Worcester County Hall, Spetchley Road, Worcester, WR5 2NP. Pete.Boardman@naturalengland.org.uk

In 2008 the author was gifted a quantity of craneflies and phantom craneflies (Tipuloidea: Tipulidae & Limoniidae, and Ptychopteridae) collected close to Mount Kupe in Cameroon by Malaise trap as part of an insect recording project carried out there three years earlier. Access to the Alexander cranefly collection in Washington D.C. was deemed essential for their identification because Charles P. Alexander (1889 – 1981) described and named 95% of currently known African species during his lifetime as an entomologist, and his collection resides at the Smithsonian Institution. Funding from the Winston Churchill Memorial Trust and the Frank Jackson Foundation enabled the author to travel to the Smithsonian Institution in Washington D.C. to use the Charles P. Alexander cranefly collection during October 2018.Studies started in Washington D.C. and continued at home in the United Kingdom led to the discovery of 21 new craneflies and one new phantom cranefly, plus a further 18 species already known from the Afrotropical region, but new to Cameroon. The author was funded to travel to the International Congress of Dipterology (ICD9) in Windhoek, Namibia last year. The author calls these congresses the 'fly Olympics' as they are held every 4 years in a different country (and often a different continent), and attract the best fly 'athletes'. The author is currently working on a paper to disseminate findings.

Subfossil chironomid assemblages as indicators of environmental changes during the early Holocene deglaciation in the High Tatra Mountains

Tímea Chamutiová[1], Ladislav Hamerlík[1], Radovan Pipík[2] & Peter Bitušík[1]

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Key words: palaeolimnology, Chironomidae, alpine lakes, deglaciation

Here we present the results of a palaeolimnological survey of the sediments of Batizovské pleso (1886 m a.s.l.), Tatra Mts., Slovakia. We analysed chironomid remains to reconstruct environmental changes in the transition between the Lateglacial and the Holocene and the timing of the valley glacier retreat. A 219 cm sequence from the total of 320 cm sedimentary sequence was analysed. According to the ^{14}C-dating, the sedimentary interval 137-211 cm corresponds to ca.12,500 to 9,375 cal. y BP. A total of 3,880 chironomid head capsules belonging to 12 taxa were found in the sediment sequence. The dominant taxa were *Micropsectra radialis*-type and *Pseudodiamesa nivosa* with an overall abundance of more than 82%. The bottom samples (90–267 cm) are characterized by cold stenothermic, ultraoligotrophic and extremely poor chironomid assemblages (up to 4 taxa) dominated by *Micropsectra radialis*-type and *Pseudodiamesa nivosa*. This community structure is nowadays rare and restricted to the coldest Tatra lakes and we hypothesise that in the sediment sequence it indicates glacial conditions in the catchment. The uppermost samples at around 90 cm are remarkable for sudden increase of taxonomic richness and appearance of new taxa. The relative abundance of the dominant *Micropsectra radialis*-type remains unchanged, while the abundance of *Tanytarsus lugens*-type starts to increase. The abundance of *Pseudodiamesa nivosa* gradually decreases toward the younger samples. The remains of *Procladius* sp., *Zavrelimyia* sp., *Heterotrissocladius marcidus*-type, *Tanytarsus mendax*-type and *Micropsectra contracta*-type occur just in the uppermost samples. We hypothesise that the appearance of these thermally plastic taxa is linked to the significant reduction or even disappearance of the valley glacier, since identical patterns were found in other Tatra lakes. Our research indicates that the biggest changes in Batizovské pleso environment took place not during the transition of Lateglacial to Holocene period but thousands of years later, some 7600 years BP. The study was supported by projects APVV-15-0292 and VEGA 1/0341/18.

"Every bog's a castle" - a summary of chironomid diversity in specific microhabitats of a Balkan peatland

Dubravka Čerba[1], Miran Koh[1], Andreja Brigić[2], Sanja Gottstein[2], Zlatko Mihaljević[2]

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Key words: peatbog, extreme environmental conditions, Chironomidae larvae

Peatlands represent very specific habitats, formed by accumulation of organic matter, mainly plant origin, sustained by anaerobic conditions. In Croatia, peatlands are rare, small and isolated habitats, thus endangered. The diversity of chironomid community was studied in the Đon močvar bog, located in central Croatia at 130 m a.s.l. On an area of 10 ha it supports a variety of different microhabitats. We sampled four microhabitats in the peat bog: shallow pools, deep pools (>2 m), ditches and a pond, and adjacent creek surrounding the bog. Sixty-one taxa from Chironomidae family were recorded, what included 22 species, of which two new for the chironomid fauna of Croatia: *Diplocladius cultriger* and *Georthocladius luteicornis*. *Polypedilum uncinatum* agg., taxa typical for peatland pools, was highly abundant in shallow ponds and ditches. Highest taxa richness was recorded in the creek (38 taxa) and the lowest in the pool (12 taxa), whilst the Shannon and Simpson indices highlight samples from shallow ponds taken in June and July as the most diverse. NMDS analysis displays a clear difference in chironomid larvae community between the creek and peat bog microhabitats. The differences between the pool and ponds are also evident, but not as substantial. BIO-ENV and PERMANOVA analyses shows statistically significant influence of pH and conductivity on the Chironomidae community structure and density. Fluctuation and extreme values of environmental parameters influenced the diversity of Chironomidae family, reflecting specific conditions of each microhabitat.

Species composition and distribution of the Chironomidae (Diptera) from the rivers and groundwater of Central Balkan National Park, Bulgaria

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Key words: Bulgaria, mountain rivers, groundwater, Chironomidae

Central Balkan National Park is an important protected area in Bulgaria. We give first data about species composition and distribution of the chironomids from the rivers and groundwater (fountains troughs and springs) of Central Balkan. A total of 34 samples were collected and 51 Chironomidae taxa where identified. From them, 14 taxa were found in fountain troughs; 10 taxa were found in springs and 29 taxa were found in rivers. About 18 taxa were found only in single sites and can be considered rare for the National Park. Species such *Metriocnemus* spp., *Paratrissocladius excerptus, Rheocricotopus (R.) effusus*, *Tanytarsus* spp. as well as small predatory chironomids such as *Zavrelimyia* spp. and *Larsia* spp. were common in the groundwater samples. *Paratrissocladius excerptus*, *Brillia bifida, Tvetenia calvescens agg., Eukiefferiella* spp. and *Corynoneura* spp. were among the more common taxa living in rivers, but occasionally they were found also in fountains troughs and springs. Most of the chironomids dwelling in fountains troughs were also found in the nearby rivers. The species *Microtendipes rydalensis* (Edwards, 1929) and *Paramerina divisa* (Walker, 1856) are new for the Bulgarian fauna. This work contributes to the knowledge of the hydrofauna of the Central Balkan National Park.

Littoral Chironomidae assemblages of Dinaric karstic lakes

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Key words: Chironomidae, larvae, karstic lakes, littoral

Lakes are inland depressions filled with water and function as drinking water reservoirs or have recreational purposes. Family Chironomidae is one of the most diverse and successful dipteran families. They can be found in the variety of habitats and are thus used in the ecological quality assessment. The goal of this study was to assess distribution and the diversity of Chironomidae assemblages in the littoral of Dinaric karstic lakes in Croatia. All of investigated lakes are situated in Dinaric Western Balkan ecoregion. Littoral of seven lakes was sampled using a standard lake littoral sampling protocol during the summer 2018. Total of 210 samples were collected with more than 26 000 chironomid larvae belonging to more than 50 taxa. The highest abundance and species richness were observed in the Lake Visovac and the lowest in the oligotrophic Lake Vrana on the Cres Island. Cluster analysis based on chironomid species composition and abundance showed grouping of lakes into three clear groups: lakes with increased levels of salinity characterised by presence of the species *Chironomus aprilinus*, barrage lakes characterised by high abundance as well as taxa richness, and oligotrophic lakes characterised by lower abundance and taxa richness. These results contribute to the widening of our knowledge of Chironomidae distribution and ecological preferences in the lake littoral.

Phylogeny of *Simulium reptans* (Linnaeus, 1758) and *Simulium reptantoides* Carlsson, 1962 – insights from Balkan populations

Jelena Đuknić[1], Jelena Čanak Atlagić [1], Stefan Andjus[1], Momir Paunović[1], Ivana Živić[2], Nataša Popović[1]

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Key words: Phylogeny, Balkan Peninsula, *Simulium reptans*, *Simulium reptantoides*

Morphological similarity among certain species often leads to misidentification. Additionally, the lack of appropriate identification keys contributes to the gaps in knowledge of the distribution of many species. Molecular methods, nowadays, are widely used to solve this problem and to expand knowledge about genetic variability and phylogeny of certain species. *Simulium reptans* (Linnaeus, 1758) and *Simulium reptantoides* Carlsson, 1962 are two morphologically similar species of *Simulium reptans* group, whose distribution hasn't been clear. There is some information about these taxa in Northern and Central Europe, regarding their genetic variability, phylogeny and distribution. Nevertheless, there is no information about them in the Southern and Eastern Europe. The Balkan Peninsula is seen as one of Southern Europe's biodiversity hotspots. However, in the Balkan Peninsula, only *S. reptans* is reported in the current inventory (Adler, 2019). In this study, mtDNA was extracted from 19 individuals from 12 localities across the Balkans. Phylogenetic analysis using mitochondrial DNA barcoding (COI) gene, clearly showed the presence of both species in the area, supported by high genetic divergence (over 7%). Each of these species consist of two molecular forms: A and B, and throughout the Balkans only the B form of *S. reptans* was detected, while *S. reptantoides* occurs with both forms (A and B).

(poster)

Longitudinal distribution and diversity of macrozoobenthos community in a Pannonian mountain stream network

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Key words: altitude gradient, macroinvertebrate community, biodiversity, conservation

Papuk Nature Park is situated in the eastern part of Croatia and consists of lowlands and mountain range, with the highest peak of 953 m a.s.l. This preliminary study was conducted with the aim to assess the changes in macroinvertebrate community structure and abundance in a mountain stream network along the altitude gradient. Macrozoobenthos was sampled in June 2019, at three sites on different altitudes: "Jankovac" (spring) 450 m, "Drenovac" (stream) 305 m and "Lovački dom" (stream) 152 m asl, with a 500 μm mesh hand net, following multi-habitat sampling procedure. The most abundant taxonomic group was Amphipoda at all three sites, followed by Chironomidae in "Jankovac" spring and EPT group with Coleoptera at other two sites. At the highest altitude, we found 6603 invertebrates/0,0625 m^2. Chironomidae larvae represented 28% of total abundance, however diversity was very low due to the specific conditions of this habitat type, and *Rheotanytarsus* sp. dominated. At "Drenovac" and "Lovački dom" 2351 and 1402 inv./0.0625m^2 were recorded, respectively. The middle altitude stream site harboured highest number of invertebrate taxa groups (26), including 9 dipteran families. Chironomidae were most diverse at the lowest altitude site as a result of most diverse microhabitats. At both stream sites, *Epoicocladius* larvae were recorded, a species very interesting for its symbiosis with mayfly nymph *Ephemera*. These preliminary results give us good starting point for the further research of benthic communities along the altitude gradient.

Diptera in diet of the European Bee-eater (*Merops apiaster*) in Southern Slovakia

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Key words: pellet, feeding, grazing, sand dune, Slovakia

Previous studies of diet of the European Bee-eater (*Merops apiaster* Linnaeus, 1758) showed Hymenoptera as the most important prey component, but it also catches aerial insects according to momentary offer. We were interested in the importance of Diptera in bee-eater's diet in our conditions. Krištín (1994) recorded no dipterans in bee-eater's diet in Western Slovakia, few in Central Slovakia (1.2 %) and the most in Southern Slovakia (10.9 %). Moreover, difference in dipterans between nestlings (6.1 %) and adults (3.0 %) was revealed. Dipterans seem to be more important part of diet in Southern Slovakia. For our research, we chose colony from pastured sand dune in Radvaň nad Dunajom. We supposed that there would be increase of dipterans diversity and abundance in bee-eater's diet after implementation of grazing, and we were interested in differences between adults and nestling's diet. Nestling's pellets from bee-eater burrows were excavated in 2015 – 2017. Pellets from adults were scattered in 2016 – 2017. Dipterans are fragile, almost no fragments of them were preserved in pellets from adults neither nestlings. For better identification of dipterans, photo documentation of bee-eater feeding was made in 2017. Photo documentation revealed that pellets are not sufficient evidence of dipterans in bee-eater feeding. Our research was supported by project LIFE12 NAT/SK/001137: BeeSandFish.

Nematoceran (Diptera) biodiversity in dead wood in Būda Botanical-Zoological Reserve in Kaišiadorys (Lithuania)

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Key words: Diptera, Nematocera, dead wood, biodiversity

The aim of this study was to investigate biodiversity of nematoceran flies developing in dead wood. Although wood is a primary habitat for vast amount of Diptera species no effort at all were made to study saproxylic flies in Lithuania. During the warm period starting from May to November the emergence tent-like traps were set up on five fallen trees in Būda Botanical-Zoological Reserve, Kaišiadorys (Lithuania). Emerged insects were collected and nematocerans were used in further research. In total, 837 specimens were identified to species. All specimens belonged to 57 species and represented 13 families of Nematocera (Diptera) with Mycetophilidae and Sciaridae being the species richest. Also, for the first time more effort has been made to study family of Sciaridae and new species to Lithuania were identified.

(poster)

Diptera as non-target insects in light traps

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Key words: Diptera, light traps, faunistic research, Czechia

A network of light traps is operated by the Central Institute for Supervising and Testing in Agriculture across the territory of Czechia. Its primary purpose is to monitor the flight activity of selected insect species (e.g. several agriculturally important species of moths) and to detect possible occurrence of quarantine insects. However, most insects (including Diptera) caught into the light traps belong among non-target species. The potential of these traps thus exceeds the former purpose and an extensive insect material is available for specialists to study. Samples of selected Diptera families (mainly Anisopodidae, Empididae, Hybotidae, Opomyzidae, Pallopteridae, Rhagionidae, Stratiomyiidae, Tephritidae, Ulidiidae) are selected from three localities occupied with light traps in the region of central Bohemia for several seasons. Preliminary results together with examples of interesting findings (e.g. species hardly available by the method of sweeping, or species listed in the red list of Czech invertebrates) are presented in the contribution. Specialists in other Diptera families are welcomed to ask for the material.

A decade of aquatic Diptera emergence studies, with emphasis on the Empididae

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Key words: Hemerodromiinae, water temperature, tufa barriers, microhabitats, sex ratio

True flies (Diptera, Insecta) are one of the most important groups of aquatic insects in respect of the number of families and abundance of individuals. The study was carried out in Plitvice Lakes at tufa barrier Kozjak-Milanovac. Several microhabitats were selected. Sampling was conducted at the end of every month, from 2007 until 2016, 10 full years, with six emergence traps placed at the site. In all, 14 families of aquatic Diptera were recorded with Simuliidae and Chironomidae as the most abundant families. The third most abundant family were aquatic dance flies (Empididae: Clinocerinae and Hemerodromiinae). The goals of this study were to analyse their preference for microhabitats, prey abundance and emergence of species. In total seven species were identified. The dominant genera were *Chelifera* and *Hemerodromia*, both represented with three species, while the most abundant species was *Hemerodromia unilineata* Zetterstedt. The sex ration in *H. unilineata* was in most years 50:50. All the species were univoltine, except *Chelifera conncinicauda*, which was bivoltine. The highest abundance of aquatic dance flies was recorded on moss and pebbles, while they did not prefer sand/silt substrate. The highest emergence rates were recorded above microhabitats with highest prey densities (Chironomidae and Simuliidae) and with highest current velocity. Water temperature and photoperiod are the main ecological factors determining the start of emergence and duration of flight period.

Occurrence of mosquitoes in the capital of Slovakia, Bratislava, between 2017 – 2019 and measures to reduce their abundance

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Key words: mosquitoes, enormous occurrence, Bratislava

Every year after the increase of water levels in many Slovak rivers, we notice an increase or calamitous occurrence of mosquitoes. This also applies to the territory of the capital of the Slovak Republic, particularly the inundated areas of the Danube and Morava rivers. Between 2017 until 2019, we intensively monitored the occurrence of mosquitoes in the territory of Bratislava city, especially at inundated areas of Danube and Morava rivers. We monitored the presence of mosquitoes also in the cadastral parts of capital city, e.g. forest parks (Železná Studnička, Horský Park, etc.). In 2017, we found local enormouse occurrence of mosquitoes only in some parts of the city e.g. Devínska Nová Ves, Devín, Malý Draždiak, oxbow lakes of the Danube River. In the first decade of June 2018 we found a local calamity occurrence of mosquitoes in many parts of the inundated areas of the Danube and Morava rivers. To reduce the number of mosquitoes, the city intervened against larval stages of mosquitoes by means of Bti. In May and June 2019, the enormous occurrence of mosquitoes in the territory of Bratislava caused by a high total of precipitation in the territory of the Slovak Republic and surrounding countries. The city decided not to fight mosquitoes this time.

Half a century of dipterological meetings – looking back

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Key words: Czechoslovak dipterological seminars, Central European Dipterological Conference, history

Czechoslovak dipterological seminars have a 50-year tradition beginning in Nitra, where the first seminar under the heading Fauna of the Western Carpathians was organized by Juraj Čepelák. The seminars continued, with a few exceptions, every two years, alternately in Bohemia, Moravia and Slovakia, even after the split of Czechoslovakia into Czechia and Slovakia. Since 2002, the seminars were unofficially, and after 2013 also officially, organised as the Central European Dipterological Conference, which made them more open to experts from other countries than previously possible. These meetings were, and have remained, very informal. The Czech and Slovak dipterists resisted all attempts to formalize or institutionalize their community. Owing to this fact, the seminars were not only an opportunity to present new knowledge in dipterology, but mainly a place for a free exchange of ideas and views. They were also the birthplace of common projects such as the Checklist of the Diptera of (then) Czechoslovakia, as well as an opportunity to discuss other joint projects.

Feeding habits of the predatory *Monopelopia tenuicalcar* (Kieffer, 1918) in an ephemeral epiphyton community

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Keywords: floodplain, macrophytes, Chironomidae, predation, food

Macrophytes represent excellent habitat for macroinvertebrates and support very high abundance of Chironomidae larvae, providing them adequate shelter and food. Chironomids display variety of feeding habits, eating various food from algae and detritus to other invertebrates. We examined the gut content of the predatory larvae *Monopelopia tenuicalcar*, that was sampled in an extremely dense macrophyte mat consisted mostly of *Salvinia natans*, *Lemna* sp. and *Spirodela polyrhiza*. The study was conducted in the Kopački Rit Nature Park, from the 2nd to the 12th July 2013, after a period of extreme flooding. Chironomid larvae were the most abundant group of macroinvertebrates, and *M. tenuicalcar*, with its unprecedented larval density, was found to be the most dominant one. After separation, the larvae were mounted on permanent slides and inspected under a microscope. Out of the 1425 individuals 640 contained some type of food residue, predominantly other Chironomidae. Most common taxa that was preyed upon was *Cricotopus sylvestris* group followed by *Corynoneura scutellata* group and smaller individuals od *M. tenuicalcar*. Other notable, recognizable, ingested material included detritus, Ceratopogonidae larvae, unidentified micro-crustaceans and plastic fibres. Later stages of Tanypodinae larvae are considered to be predators and the predatory behaviour of *M. tenuicalcar* has been recorded before, favouring macrophytes as their „restaurant“.

The diversity of the fossil genus *Mesotipula* in Asia

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Keywords: Mesotipula, Limoniidae, Diptera, Asia

The fossil genus *Mesotipula* from the family Limoniidae (Diptera) was described by Handlirsh in 1920 from Jurassic of Germany. He classified two species to this genus *M. brachyptera* Handlirsch, 1920 and *M. curvata* Handlirsch, 1920. Currently the genus consists of 12 species known from Europe, Asia, Australia. Its representatives are characterized by stable and slightly diverse wing venation in radial sector, with veins Rs and R_4 situated on one line, R_4 is a continuation of vein Rs, vein R_{2+3+4} is very short or absent. Whereas, medial sector is more variable. Significant changes are visible in the shape of d-cell and in position of cross-vein m-cu. Upper part of the d-cell is shorten and cross-vein m_{1+2}-m_3 closing the cell is situated in vertical position or is oblique and directed to the base or to distal parts of the wing. The position of cross-vein m-cu is also variable. Location of this cross-vein was a reason why Lukashevich in 2009 establish new subgenus *Metatipula*. Analyses of new materials from localities Sharteg, Mongolia (Upper Jur); Unda, Siberia (Jurassic and Cretaceous); Kempendyay, Yakuts, Russia (Lower Cretaceous) and Bon-Tsagan, Mongolia (Lower Cretaceous) extend our knowledge about evolution of this genus. Three new species and one subgenus have been established.

How the wing venation pattern has evolved in selected groups of Diptera? Fossils – key to Diptera phylogeny

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The first 100 million years of Diptera evolution are exclusively documented in sedimentary rocks, making information for that period fragmentary, both in terms of specimen preservation and evolutionary history. Nevertheless, their morphology is our only source of information, since genetic material is not preserved and not applicable, even that extracted from amber inclusions. The oldest known Diptera are dated to the Anisian (242–247 Ma) and originate from the Middle Triassic of the Vosges Mountains of north-eastern France. Although Triassic Diptera are very scarce and only rarely found, they already represent all the main evolutionary lineages, *i.e.*, Anisopodomorpha, Brachycera, Culicomorpha, Psychodomorpha, Ptychopteromorpha and Tipulomorpha (according to the modern classification, based on molecular data). The Jurassic was a period of evolutionary radiation and domination of the "lower Diptera", while the Brachycera were still poorly represented and poorly differentiated. The first Diptera preserved tri-dimensionally occur in fossil resins, the oldest being inclusions in Lebanese amber *ca* 145 MYA. The richest assemblages, however, are found in amber from Myanmar ("Burmese amber" - 99 Ma). Preserved specimens allow us to examine the entire body structures of long extinct lineages with accuracy and to compare these to extant Diptera. The Cretaceous was a time of profound change in the dipteran fauna. The Brachycera evolved rapidly, and by the Upper Cretaceous, almost all recent families were represented, while the "lower Diptera" had already undergone complete remodelling. Many families, subfamilies and genera of Triassic and Jurassic origin had disappeared, being replaced by the modern fauna.
Homology of the radial, cubital and anal veins in Mecoptera and Diptera was correctly resolved by R.J. Tillyard as early as 1919 and later by G.W. Byers in 1989, both of whom based their ideas on comparison of wing venation in the Mecoptera and Diptera. Today, there are two different systems in common use, one proposed in volume 1 of the *Manual of the Nearctic Diptera* (published in 1981) and one in the newly published volume 1 of the *Manual of Afrotropical Diptera* (published in 2017). Further examples are presented here, based on newly discovered material of Mecoptera from Myanmar ("Burmese amber") and the Lower Cretaceous of England. Diptera have only one cubital vein (*Cu*), homologous with vein Cu_1 (or *CuA*) in the Mecoptera. The second cubital vein in Mecoptera, named *CuP* (or Cu_2), had disappeared in the Diptera completely. The first anal vein (A_1) is homologous in the Diptera and Mecoptera and its presence is a plesiomorphic state in the Diptera and cannot be identified with *CuP* of the Mecoptera. The second anal vein (A_2), which is characteristically long in the Tipulomorpha, must have arisen independently (secondarily), since the Tipulomorpha do not constitute sister-group to the remaining Diptera (according to earlier investigations both of fossils and molecular data).

How can frit flies also look (Diptera, Chloropidae)?

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Key words: frit flies, characteristics, *Formosina*, *Thressa*, *Neoloxotaenia*

The adults of frit flies do not belong to giant Diptera. Usually they have a yellow body with dark (black, brown) or reddish stripes on the scutum (sub. Chloropinae) or they are all black or dark brown with various metallic reflections (sub. Oscinellinae and Siphonellopsinae). The head is usually with large, clearly visible frontal triangle. Ocellar, postocellar, inner and outer vertical setae developed, but sometimes can be very small. Orbital setae are reduced in length; in some genera are 1 - 3 setae may be noticeably elongated (*Elachiptera* and others). Arista is usually filiform, but in some genera it is noticeably widespread due to the large number of long dark microtrichia (e.g *Elachiptera*). The faces are flat or concave in most genera, but some species have developed a noticeable vibration angle (*Aphanotrigonum*, *Tricimba*, *Siphonella* and others). Proboscis is relatively small, slightly sclerotized and folded does not protrude before the epistoma, but in some genera it is strikingly long, strongly sclerotized and folded prominently protrudes before the epistoma (*Siphonella*, *Oscinimorpha*). Scutum is short and broad in most species, with setulae irregular or arranged in longitudinal rows. Postpronotum with one seta, only in the subfamily Siponellopsinae are developed two. Notopleural setae 1 + 1 or 1 + 2. One dorsocentral (prescutellar) seta is developed, only Siphonellopsinae have 1 + 3 setae. Anepisternum glabrous in most genera, only in some species with setulae. Katepisternum with dorsal and ventral setae in most genera. Scutellum is very variable in shape, usually with one pair of apical and one or two pairs of lateral setae, which in some species may grow from warts of different lengths. These are the basic characteristics of most frit flies. However, there are a number of genera (especially from tropical regions) whose representatives are so visually different from this characteristic that it is often difficulties in determining the family (e.g. *Apotropina*, *Anatrichus*, *Myrmecosepsis*, *Sepsidoscinis*, *Echimba*, *Formosina*, *Thressa*, *Neoloxotaenia*, *Ensiferella* or *Stenophthalmus*).

Black fly fauna of Spain

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Key words: Simuliidae, Iberian Peninsula, taxonomy, cytotaxonomy, genetic diversity

Altogether, 49 black fly species were reported from the territory of Spain, excluding the Canary Islands. Only two species (*Simulium hispaniola* Grenier & Bertrand, 1954 and *Simulium xanthinum* Edwards, 1933) were described based on material from Spain, and only one species (*Simulum ibericum* Crosskey & Santos Grácio, 1985) has endemic distribution on the Iberian Peninsula. The species composition of black fly fauna of Spain was compared with other countries of Europe, North Africa, and Near East. Based on Baroni-Urbani and Buser similarity index, three methods of hierarchical clustering (single linkage, complete linkage, UPGMA) showed three different patterns of how Spanish black fly fauna might be classified. The fauna of France was always the closest to Spain. Together they were the most similar either to a cluster formed by six central European countries, or to Portugal and Italy, or they formed a sister cluster to Algeria and Morocco. The fauna of Spain shares species with European western Mediterranean, north-western Africa and central Europe. The preliminary taxonomic study of several species representing various groups of species using a combination of morphology, cytotaxonomy and molecular data indicates the presence of unrecognized species differing from those present in other parts of Europe. It can be expected that the real similarity with central European black fly fauna is significantly smaller and it is the consequence of deficient taxonomy.

DNA barcoding as an identification tool for black flies

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Key words: Simuliidae, taxonomy, species identification, DNA barcoding, Central Europe, cytochrome c-oxidase I

Black flies (Simuliidae) are a morphologically uniform group and the identification of species requires a certain level of expertise. Especially females, that are difficult to identify, are often causing biting problems and transmitting diseases, therefore their proper identification is crucial. Besides morphology, the identification methods based on DNA are becoming more widely used. DNA barcoding is considered a powerful method for species identification and has been successfully used also for identification of black flies. Together 190 sequences of the barcoding region of mitochondrial COI gene of 17 black fly species were analysed. The values of intraspecific genetic divergence were between 0 and 8.01%, whereas the values of interspecific genetic divergence were between 0.21% and 22.47%. Most of the individuals belonging to the same species were clustered together. The exception was one overlapping cluster formed by the species *Simulium argyreatum, S. variegatum* and *S. maximum* that shared identical sequences. The highest values of intraspecific genetic divergence were recorded in *Prosimulium latimucro* and *P. tomosvaryi* suggesting they might be species complexes.

Sixteen-meter water depth: A chironomid distribution boundary independent of environmental conditions?

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Key words: Chironomidae, water depth, deep lakes, Tibet

Water depth or rather related important environmental factors have been shown to be major drivers of within-lake chironomid head capsule distribution patterns. The relationship between chironomids and water depth has been modelled in several site-specific as well as local to regional water-depth inference models of shallow lakes. Comparable studies from deep lakes are still sparse. Here we present a comparison of results from surface sediment samples from the two large and deep Tibetan lakes Taro Co and Selin Co. They provide a unique opportunity to study the relationship between water depth and chironomid associations, because both lakes are located at similar elevation (4567 and 4546 m a.s.l.) but feature different salinities. Taro Co is a fresh (0.5 ppt) and Selin Co a saline water lake (7-10 ppt). A total of 62 (Taro Co) and 134 (Selin Co) surface sediment samples were collected from the lakes with water depths ranging from 0.3-125 m and 0.2-52 m, respectively, and analysed for chironomid remains. While the lakes differ in their faunal composition, they show similar significant zonal boundaries, defining a splash (0-0.5 m), a littoral (0.5-16 m) and a profundal zone (>16 m). None of the measured water depth-related factors such as water temperature, oxygen content, sediment properties, light intensity or macrophyte vegetation show changes at 16 m water depth in both lakes. We propose to discuss that this boundary might be connected to the sheer distance to the surface.

Chironomidae (Diptera) of Malta: first records from the driest country of Europe

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Key words: DNA barcoding, larvae, exuviae, adults, Mediterranean region

The freshwater macroinvertebrate fauna of Malta is little known, especially in the case of the family Chironomidae, since no species have been published to occur in the Maltese Archipelago yet. In 2018 we visited 80 sampling sites (including natural and artificial water bodies) to collect aquatic macroinvertebrates, among them larvae, pupal exuviae and adults of non-biting midges. Beyond morphological identification, selected specimens were identified using DNA sequences as well. Up to date 31 species level taxa were identified. In some cases, the species level identification was not possible by neither morphological characters nor DNA barcoding, thus the number of species most probably will increase as a result of further investigations. The most species were collected in permanent flowing and standing waters, while temporary small standing waters were inhabited only one or two generalist species. Salt marshes represent unique habitats with halophil and halobiont species. All but two species are widely distributed in the West Palaearctic region. Two species were recorded from Europe for the first time: *Hydrobaenus sikhotealinensis* has only been recorded from the Far East, while *Chironomus transvaalensis* has been known as an Afrotropical species. The surprising presence of these two species highlights that our knowledge on the distribution of chironomid species is still limited, even in the case of the otherwise relatively well known European fauna.

Subdivision of the subfossil chironomid larvae *Micropsectra radialis*-type on the Tibetan-Plateau

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Key words: Chironomidae, Tanytarsini, taxonomy, subfossils, Tibet

Taxonomical identification of subfossil chironomids relies on morphological characteristics of larval head capsules, and in many cases not enough detail is preserved to allow identification to species level. Nevertheless, their preservation in lake sediments makes them very valuable for paleoecological reconstructions. Especially research in the Tibetan Plateau with its high amount of endemics and their degree of specialization depends on highly resolved taxonomical classification. Due to the difficult accessibility of Tibetan sites the taxonomic information for chironomids is still sparse. One of the taxa comprising ecologically different species, is the *Micropsectra radialis*-type, a widespread species group on the Tibetan Plateau. Here we present a subdivision of the *Micropsectra radialis*-type, based on head capsules found in a sediment core taken from the Tibetan lake Taro Co, into the subtypes *M. radialis*-type (Heiri et al. 2004), type B and type C. This differentiation is based on presence, absence and form of the spur on the antennal pedestal, form and length of ventromental plates and mentum, different characteristics of the median tooth as well as a white patch behind the median tooth. Significant differences in their distribution along the core prove the importance to define this higher taxonomical level and highlight the necessity for further studies focussing on different ecological preferences.

(poster)

Agromyzidae (Diptera) of Hungary – a project successfully accomplished

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Key words: Agromyzidae, *Chromatomyia, Napomyza, Phytomyza*, identification, Carpathian Basin

A high number of important agromyzid pests of the cultivated plants occur in the Carpathian Basin. On the contrary, their identification was formerly difficult in lack of comprehensive books on the Central European Agromyzidae. Our project launched in 2014 and the last volume (Vol. 4) will be published at the end of 2019, by which a safe identification of all agromyzid species of the middle areas of Europe is mostly possible. Vol. 1 included a general part (morphology of adults and larvae, phylogenetic relationships of Agromyzidae, classification, life-habits, economic importance and the history of studies on the Hungarian Agromyzidae). The species entries on each species include *Diagnostic features* (particularly of the male genitalia) - *Faunistic status* - *Life-habits* - *Economic importance* - *Comments*. A catalogue with occurrence data in Slovakia and in the Czech Republic, the references and a taxonomic index are attached to each volume. Vols 1 to 3 were published one volume/year to 2017. The main data are as follow:

Vol./year	Pages	Figs	species incl'd (sp. expected)	spp. new to HU	spp. new to science
1 (2015)	416	1319	155(-34)	72	11
2 (2016)	385	1277	127(-30)	25	2
3 (2017)	427	1387	135(-30)	56	8
4 (2019)	c.600	2000+	224(-56)	107	17

Our original estimate of 700–750 agromyzid species present in the Carpathian Basin can be corroborated; the species which have not been collected and the undescribed ones (which are probably more than we thought originally) will give even more tasks for the future.

Non-biting midges (Chironomidae) from artificial water bodies in Belgrade sub-urban area

Nataša Popović[1], Dubravka Čerba[2], Maja Raković[1], Jelena Tomović[1], Ana Atanacković[1], Nikola Marinković [1], Marija Ilić[1], Stefan Andjus[1], Jelena Đuknić[1], Jelena Čanak Atlagić[1], Petar Smiljanić[1], Momir Paunović[1]

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Key words: chironomids, anthropogenic pressure, sub-urban area

Water bodies in Belgrade sub-urban area are under considerable anthropogenic pressure. Rivers and channels discussed in this study pass through industrial zones, agricultural and urban areas, and play an important role in draining atmospheric water and wastewater. Reservoirs in Belgrade vicinity are also under diverse anthropogenic influence. Macroinvertebrate samples were collected in June and September 2018 from 21 water bodies (9 rivers, 8 canals, and 4 reservoirs), following MHS sampling procedure. Chironomids were dominant in all samples and as such, they were analyzed independently. A total of 69 chironomid taxa (48 – rivers, 29 – reservoirs and 25 – channels) were recorded, within 4 subfamilies (Prodiamesinae, Orthocladinae, Tanypodinae and Chironominae). The most abundant species altogether was *Chironomus riparius,* with highest abundance in Barička reka. In reservoirs, the most abundant non-biting midges belong to genus *Procladius* and *Ablabesmyia monilis* agg. while in the channels the most abundant were *Parachironomus arcuatus* agg. and *Cricotopus* s*ylvestris* group. High dominance of chironomids in macroinvertebrate communities, as well as the chironomid community structure itself, suggest that they could be efficiently used for assessment of anthropogenic pressure in sub-urban areas.

(poster)

Surveillance of mosquitoes (Diptera, Culicidae) in South Bohemia (Czech Republic)

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Keywords: Mosquitoes, West Nile Virus (lineage 2), South Bohemia

The mosquito fauna has been monitored in the Třeboň Basin (South Bohemia, average altitude of 453 m a.s.l.) since 2012. Mosquito larvae were collected using a wire strainer. Mosquito females, possible arboviruses vectors, were trapped by Encephalitis Vector Surveillance traps (EVS) with CO_2 as attractant. Traps were placed on approximately 30 sites, mostly close to ponds, especially to their reed zones (*Phragmites australis*). Thirty mosquito species have been identified in the study area, with *Uranotaenia unguiculata* Edwards 1913 and *Anopheles hyrcanus* (Pallas 1771) being new species to Bohemia. The area north of the Třeboň city (49°N, 14°46′E) is one of the northernmost points of regular occurrence of these thermophilic species in Europe. In 2015-2018, we focused on trapping *Culex modestus,* a proven vector of West Nile Virus, which was then abundant species in pond reed vegetation. No WNV was detected in *C. modestus* in the catches made in 2015-2017. In 2018, we collected mosquitoes (total 29,207 females) in the area of the Velký Tisý and neighbouring ponds. The June-September 2018 catches of *C. modestus* Ficalbi 1889, *C. pipiens* Linnaeus 1758 and *Coquillettidia richiardii* (Ficalbi) 1889 were screened for the presence of WNV. A total of 6,790 females were examined by molecular methods. In a sample (pool) consisted of 33 females of *C. richiardii* caught 26 July near a little pond Šaloun (49°4′9′′N, 14°42′45′′E) and in a sample consisted of 50 females of *C. modestus* caught 12 September in reeds of the Velký Tisý pond (49°4′41′′N, 14°45′20′′E) WNV lineage 2 was detected using specific one step RT-PCR with primers designed for amplification of WNV-2.

(poster)

How time flies with anthomyzid flies…

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Key words: *Anthomyzidae*, *Anthomyza*, *Epischnomyia*, *Argantomyza*, DNA, molecular dating, Palaearctic, Nearctic

The phylogenetic hypothesis of the relationships of the *Fungomyza* Roháček, 1999, *Anthomyza* Fallen, 1823, *Epischnomyia* Roháček, 2006 and *Arganthomyza* Roháček, 2009 species (Diptera: *Anthomyzidae*) has been presented based on multigene analyses of the extended set of species (in comparison to that of Roháček & Tóthová 2014). The new molecular hypothesis is in good agreement with that of Roháček & Barber (2016) based on morphological data and it resolved relationships of some E. Palaearctic species affinities of which have hitherto been unclear. Timing of evolution of Holarctic *Anthomyzidae*, with special regards to most speciose genus *Anthomyza*, is discussed. The time of lineage divergences were calculated using Beast 1.8.3 and the results are compared with age of existence of continental bridges between Palaearctic and Nearctic regions and their interruptions and/or climatic oscilations during the Cenozoic Era (when the evolution of Anthomyzidae has been in progress) causing the spliting of Nearctic–Palaearctic sister group taxa by allopatric speciation (vicariance).

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(poster)

Another acalyptrate fly (Diptera) from the Eocene Baltic amber of unknown family affiliation?

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Key words: new fossil taxon, Diptera, Acalyptrata, Opomyzidae, Anthomyzidae, Opomyzoidea, Eocene, Baltic amber

A new fossil species representing an unknown genus of Acalyptrate Diptera (Fig. 1) has been discovered in Baltic amber (Eocene, 56.0–33.9 MYA), probably originating from Yantarny (Russia: Kalinigrad vicinity), in the collection of Ch. and H. W. Hoffeins (Hamburg). The only specimen, a well-preserved male, displays a peculiar combination of morphological characters that prevents its inclusion in any of the known families of Diptera. Although resembling members of the family Anthomyzidae in general appearance, its head chaetotaxy and wing venation indicate some affinity to the Opomyzidae. However, it does not belong to the latter family because it differs from the opomyzid ground plan characters in having a true vibrissa, postverticals and anepisternal (mesopleural) seta absent, only 1 postalar seta, dorsal preapical seta on mid and hind tibiae and strongly divergent antennae. Nevertheless, it is suggested that this new taxon most probably belongs to the superfamily Opomyzoidea and may represent an ancient (more basal) lineage related to the Opomyzidae–Anthomyzidae pair.

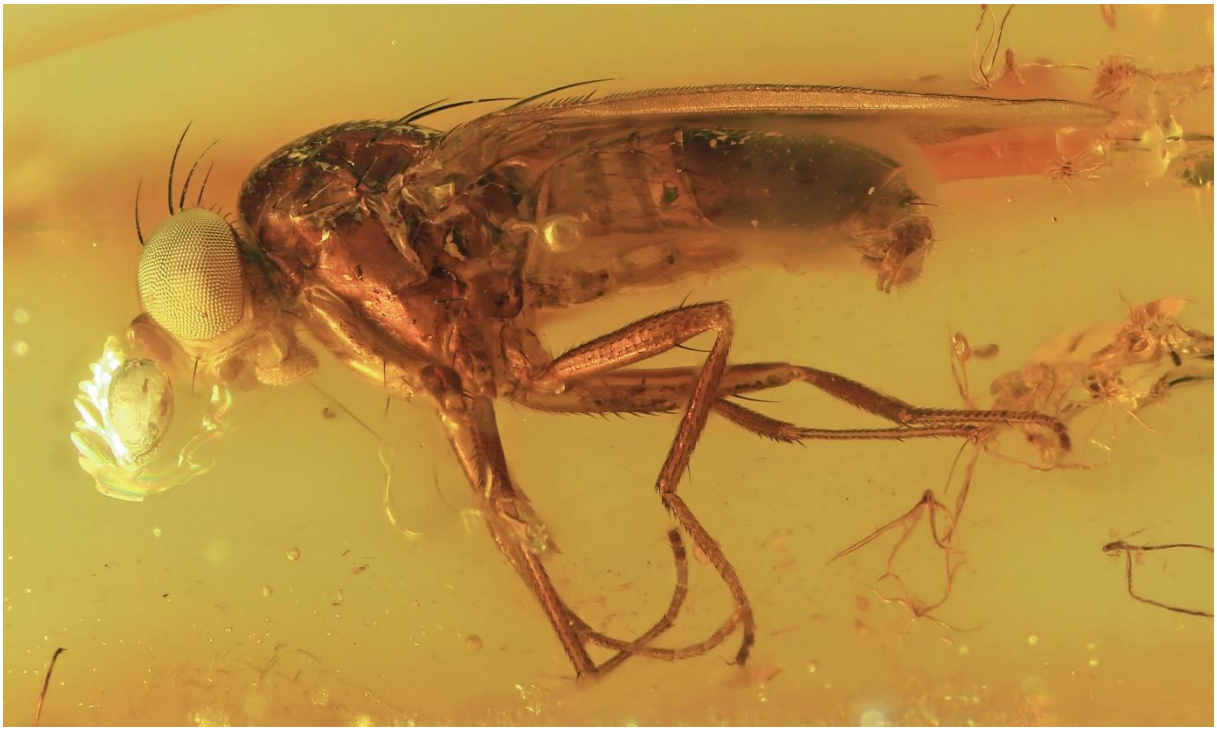

Fig. 1. Opomyzoidea (Diptera: Acalyptrata), gen. et sp. n. (family?), Baltic amber, left lateral. (body length 3.0 mm). Photo by J. Roháček

New Bruchomyiinae in Baltic amber

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Key words: Psychodidae, Diptera, taxonomy, fossil

Psychodidae Newman, 1834 is a family of lower (i.e. nematocerous) Diptera which is occupying a broad range of ecological niches. Morphology of this group is very diverse. Immature stages are aquatic to fully terrestrial. The current classification of Psychodidae includes six extant subfamilies: Bruchomyiinae Alexander, 1921; Horaiellinae Enderlein, 1937; Phlebotominae Rondani, 1840; Psychodinae Newman, 1834; Sycoracinae Jung, 1954 and Trichomyiinae Tonnoir 1922; and one extinct subfamily, Datziinae Stebner Solorzano-Kraemer, Ibanez-Bernal and Wagner, 2015 known only from the Cretaceous Burmese amber. Bruchomyiinae was originally described as a subfamily of Tanyderidae (Alexander 1921), but Edwards (1921) subsequently indicated the group to belong to Psychodidae. Information about fossil Bruchomyiinae is relatively limited. Based on materials from Baltic amber Wagner, 2017 established new genus *Hoffeinsodes* in which he classified all mamberes of a genus *Nemopalpus* Macquart, 1838 known from this fossil resin. In new fossil materials we have found another representative of this group. Discoveries of new taxa, fossil and extant and further analyses of morphological and molecular characters is necessary because the group is poorly characterized and relationships among all subfamilies remain a matter of debate.

Snow activity of flies in Central Europe – diversity, ecology and life strategies

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Key words: snow activity, life strategies, Trichoceridae, Limoniidae, Phoridae, Heleomyzidae, Sphaeroceridae, Chironomidae

In Central Europe winter-active insects are a significant part of the fauna. As Diptera are the best adapted insects to harsh conditions and environment, they dominate the fauna of cold regions, high altitudes, as well as winter and snow-active fauna supplying food for winter-active spiders, non-hibernating insectivorous shrews or even for bats. Snow-active flies are capable of being active on snow surfaces quite regular at temperatures down to -4^{o}C, but exceptionally even down -16^{o}C on glacier, due to their behavioural, morphological and physiological adaptations. To the best adapted Diptera to low temperatures and most abundant on snow surface belong representatives of six dipteran families: Trichoceridae, Limoniidae, Chironomidae, Phoridae, Heleomyzidae and Sphaeroceridae. Although the snow and winter activity of flies is frequently discussed, only few comprehensive research has been published to date. The presentation gives a summary of long-term study on snow-active flies in Poland. The main objective of this study was to describe the structure snow-active Diptera communities of the lowlands and highlands, to find out what influence atmospheric conditions have on they dispersion, and to explain the winter emergence, sexual behaviour and copulation, as well as mate-searching strategies of some these dipterans. The winter emergence and mate strategies of flies are discussed in a light of significant climate changes observed in winters, which are becoming milder in Central Europe with decreasing number of days with permanent snow cover.

A new perspective on phylogeny of the subfamily Limnophilinae (Limoniidae: Diptera)

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Key words: Limoniidae, Limnophilinae, phylogeny

Family Limoniidae includes over 10,000 species, more than 300 of which occur in the Czech Republic and Slovakia. They have slender bodies, with long and narrow wings and long legs. Worldwide, both their larvae and adults typically occur in moist environments. The size of adults ranges between 2 mm and 3 cm. According to European authors, the family Limoniidae belongs to the infraorder Tipulomorpha, together with the families Cylindrotomidae, Pediciidae, Tipulidae, and Trichoceridae. The family is further divided into four subfamilies (Dactylolabinae, Limnophilinae, Chioneinae, and Limoniinae). There are also alternative theories about the phylogeny of Limoniidae. In 2010, Petersen et al. defined two families, namely Tipulidae and Pediciidae, where the Limoniidae and Limnophilinae belong to the family Tipulidae and do not have a status of monophyletic taxa. The aim of my study is to reconstruct phylogenetic relations between selected genera of the subfamily Limnophilinae using multigene approach, with special focus on the question of monophyly of this subfamily.

Larvae of aquatic Diptera as predators and prey: some examples of predator-prey interactions

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Key words: predation, tubes, Chironomidae, Ceratopogonidae, video

Larvae of aquatic Diptera take an important part in predator-prey interactions, both as prey and predators. In this contribution we present the success of various types of chironomid tubes in the protection against omnivorous amphipod *Gammarus fossarum* Koch, 1836, and a video of the predatory behaviour of two Diptera larvae: *Monopelopia tenuicalcar* (Kieffer, 1918) (Chironomidae, https://youtu.be/o6-8dA1XDy0) and *Bezzia* sp. (Ceratopogonidae) will be projected. We thank to the Czech Science Foundation (GACR) for financial support (P505/16-03881S).

Bibionomorpha of Taiwan: A mixture of tropical and montane elements

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Key words: Sciaroidea, fungus gnats, new records, new species

Interesting findings of various taxa of Bibionomorpha (Diptera) in Taiwan are presented, based mainly on two field trips to the island in 2018 and 2019. Examples are given of the most interesting taxa from the families Axymyiidae, Mycetophilidae, Keroplatidae and Sciaridae. The phylogenetic position and taxonomy of the peculiar genera *Deimyia* Kallweit, 1998 (Mycetophilidae), *Sciarokeroplatus* Papp & Ševčík, 2005 and of a new genus near *Burmacrocera* Cockerell, 1917 (Keroplatidae) are commented on in more detail.

DNA barcoding of the Czech and Slovak gall midges (Diptera: Cecidomyiidae): Beginning of a long journey

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Key words: Sciaroidea, gall midges, Cecidomyiidae, DNA barcoding, COI marker

Current state and perspectives for the future of the long-term project focused on DNA barcoding of the Czech and Slovak gall midges (Diptera: Cecidomyiidae) are presented and commented. DNA sequences accumulated during the previous project at the University of Ostrava, focused on the multigene phylogeny of the entire family were the starting point for the project. Several examples of integrative taxonomic approach, combining molecular data with morphology of male terminalia, are presented on the genera *Asphondylia* Loew, 1850 and *Planetella* Westwood, 1840, with focus on the species delimitation and host specificity. Future plans and challenges related to this project are briefly outlined.

Influence of fish introduction on subfossil Chironomidae in a mountain lake (Vyšné Račkovo pleso, Tatra Mts.)

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Key words: non-biting midges, fish stocking, high altitude lakes, West Tatra Mts., paleolimnology

Introducing non-native fish into mountain lakes brings a range of direct and indirect consequences for the entire ecosystem. The presence of fish affects nutrient dynamics and by selective predation changes the structure and biomass of zooplankton and benthic fauna. Lakes of the Tatra Mountains, with two exceptions, were without a natural fish population in the past. Extensive but very weakly documented stocking of some lakes began in the mid-19th century. The species introduced to the Tatra lakes were mainly brown trout (*Salmo trutta* m. *fario*) and rainbow trout (*Oncorhynchus mykiss*) and in the Western Tatra lakes also alpine bullhead (*Cottus poecilopus*) as a natural food for brown trout. Since we do not know when exactly fish introduction took place and how it influenced the original lake ecosystem, we carried out a paleolimnological survey of the sediments of a mountain lake in the West Tatra Mts. The study lake, Vyšné Račkovo pleso, is a small lake (0.7 ha, max. depth 12.3 m) of glacial origin situated at 1697 m a.s.l. According to the historic data, populations of brown trout and alpine bullhead were introduced to the lake in the past and while the population of the trout went extinct, bullhead remained in the lake until now. To study the influence of changes in fish population on subfossil Chironomidae, a 24 cm long sediment core was taken from the deepest part of the lake in November 2018. In general, this amount of sediment accumulates in the nutrient poor Tatra lakes for more than 200 years. We have identified 30 taxa of Chironomidae from five subfamilies. Lacustrine taxa, such as *Heterotrissocladius marcidus*, *Tanytarsus lugens*-type and *Paratanytarsus austriacus*-type were dominating together with the rheofilous *Eukiefferiella fittkaui*-type and *Diamesa* spp. The results indicate that fish introduction did not impact significantly the taxonomic composition and diversity of Chironomidae. Changes in the assemblage composition in the youngest sediments with the extensive occurrence of thermally plastic taxa indicate warmer conditions. Results of dating and the analysis of other proxies, such as diatoms and cladocerans will bring a more complex view at the changes of the lake ecosystem. Research was supported by projects APVV-15-0292 and VEGA 1/0341/18.

Diptera diversity of Muránska planina and Cerová vrchovina (Slovakia): the current state of investigation and possibilities of cooperation

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Key words: Gemer, National park, Protected landscape area, biodiversity, faunistics, species conservation

Several groups of Diptera are currently investigated in Muránska planina National Park (MPNP) and Cerová vrchovina Protected Landscape Area. Some part of this research is already finished (mainly from MPNP) and published in the form of faunistic lists with remarks on biology accompanied with photographs of studied species and their habitats. The ongoing research is focused on several dipterous groups: families Sciaridae, Cecidomyidae, Mycetophilidae, Keroplatidae and Bolitophilidae from lower Diptera; families Xylophagidae, Athericidae, Tabanidae, Xylomyidae and Stratiomyidae from orthorrhaphous Brachycera and cyclorrhaphous families Opetiidae, Platypezidae, Clusiidae, Acartophthalmidae, Anthomyzidae, Opomyzidae, Stenomicridae, Periscelididae, Asteiidae, Micropezidae, Psilidae, Heleomyzidae, Sphaeroceridae, Hippoboscidae and Faniidae. The current state of knowledge of those families from both areas is presented and most interesting records are commented in detail. During our collecting activities was accumulated material also from families, which are out of our scientific focus and are now available for further studying by other researchers. These are families Bibionidae, Scatopsidae, Therevidae, Rhagionidae, Asilidae, Bombyliidae, Conopidae, Empididae, Hybotidae, Dolichopodidae, Syrphidae, Pipunculidae, Lonchaeidae, Drosophilidae, Chloropidae, Sciomyzidae, Lauxaniidae, Ephydridae, Tephritidae and Scatophagidae.

About a new tephritid fruit fly species (Diptera, Tephritidae) in the Czech Republic

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Key words: *Rhagoletis completa*, Diptera, Tephritidae, Czech Republic

During the summer of 2017, I caught 2 pairs of the Walnut Husk Fly (*Rhagoletis completa*) on the leaves of the mature Common Walnut (*Juglans regia*) in Drnholec. In the late summer of 2018, I noticed an enormous occurrence of larvae drowned in rainwater on a tarpaulin protecting the surface of the pool under the tree. It was obvious that the nuts are mostly black, and the infestation of the fruits is massive. During October 2018, I focused on occurrence of puparia in the soil under the infested tree. Within 10 minutes I found 10 puparia in one place. To quantify their density, I took a sample of $1dm^3$ of loam under the tree. Undamaged puparia were placed into eprouvettes sealed with tampons and put into a hatchery with a moistened substrate. I put the hatchery into the fridge for one month and then checked the puparia regularly. Hatchability rate of puparia, hatched during the period of March – April 2019, was very high (13/14, i.e. 92.9%). Of course, the adults appear outdoor much later, as evidenced by 3 individuals found in the period 6. – 11. August 2019. Additionally, I carried out an analysis of 10 randomly selected nuts with damaged pericarp from last year's harvest and found blackening of kernels in 2 cases, browning in 3 and normal colour and taste in 5 kernels. The aim of the presentation is to introduce an attractive fly, which is not yet known outside the territory of South Moravia in the Czech Republic, as well as the damage that its larvae can cause during massive infestations.

Phylogeny of the tribe Atissini (Diptera: Ephydridae)

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Key words: Atissini, phylogeny, proboscis

The tribe Atissini was proposed by E. T. Cresson, Jr. in 1942, for a group of shore flies with densely microtomentose, curved aristal branches and the posterior notopleural seta distinctly removed dorsad from the notopleural sutural margin and the current limits of the genus were established by T. Zatwarnicki in 1992. Atissini represent the smallest shore flies and these rarely exceed 2 mm in length. Eight genera are known: *Asmeringa* Becker, *Atissa* Haliday in Curtis, *Cerobothrium* Frey, *Isgamera* Giordani Soika, *Pelignellus* Sturtevant & Wheeler, *Ptilomyia* Coquillett, *Schema* Becker and *Subpelignus* Papp. Relationships among Atissini genera are based on characters of the proboscis, especially the shape of the pseudotracheae, the structure of the cibarial sensillae and also the shape of the ventral receptacle. Results of a phylogeny of the Atissini are presented, which indicate two recognised branches, with the most derived group (*Asmeringa* + *Cerobothrium* + *Isgamera*) characterised by the lack of ventral cibarial sensillae and the hypopygium with a genital plate.

An unexpected high diversity of the Old World rhinophorid genus *Stevenia* (Diptera, Rhinophoridae)

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Key words: *Rhinophoridae, Stevenia*, phylogenetics, DNA, Old World

The woodlouse flies of the genus *Stevenia* Robineau-Desvoidy have mainly a West Asiatic – Mediterranean distribution inside the Palaearctic Region with a few exceptions of species which occur in the Oriental and Afrotropical Regions. Recently, one species has been also introduced in North and South America. All species of the genus show morphological similarity in combination of a high-level intraspecific variation. Therefore, we performed a reconstruction of phylogenetic relationships using multigene data matrix of *Stevenia* species and of other Rhinophoridae based on an extended set of species in comparison to that of Ziegler & Tóthová (2014). The results strongly confirmed the validity of the tested species as well as the monophyly of the genus *Stevenia*. The next relatives of *Stevenia* are the species of the genera *Acompomintho* and *Tricogena*. These three genera form together a monophyletic unit which might be the probable sister group to the genera *Azaisa*, *Oplisa*, *Rhinomorinia* and *Ventrops* (as suggested also by our previous study in 2014). For the first time is confirmed that all these genera (which share apomorphic characters in male postabdomen) form together the sister group of the other remaining Rhinophoridae. The genus *Stevenia* was previously known from 25 species (Gisondi et al. 2019). Our recent DNA dataset consists of 23 species. The results suggest the necessity to revise the status of three species which are incorrectly synonymized at the present as well as to describe 11 additional new species from West Asia and the Mediterranean in the future.

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(poster)

EXTENDED ABSTRACTS

How to choose correctly methods of identification of parasite pathogens in Culicoides?

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Key words: *Culicoides*, *Onchocerca*, haemosporidia, cytochrome b, 18S rDNA

Introduction

Biting midges (*Culicoides*), presence of which has been observed all over the world, are taxonomically divided into 30 subgenera and more than 40 species complexes that currently identify 1,355 species (Rádrová et al., 2015). Sixty-four species of biting midges have been confirmed so far in Slovakia (Sarvašová et al., 2017). These small Diptera play an important role in pathogens transmission (Borkent, 2005); their bites induce hypersensitive reactions in humans as well as animals. In birds and lizards, they transmit haemosporidia; in horses and wild animals, they are responsible for the transmission of filariae (Garvin and Greiner, 2003). They serve as vectors of many arboviruses (Mellor et al., 2000), for example, Oropouche virus that infects humans, African horse sickness virus (AHSV), bluetongue virus in sheep (BTV), and Schmallenberg virus that is infectious for domestic and wild ruminants (Purse et al., 2007).

Majority of *Culicoides* species suck blood of mammals, including humans and birds; however, some species parasitize also reptiles and frogs (Miltgen and Landau, 1982). The most populous species in the Palaearctic Region is *Culicoides obsoletus*, which is present at locations where ruminants are, bred (Carpenter et al., 2008). This species has been confirmed as a vector of the Schmallenber virus and *Onchocerca* and a potential vector of the Bluetongue virus. Biting midges parasitizing horses and small ruminants include, for example, the Culicoides *parroti* species (Gerry et al., 2009); *Culicoides impunctatus* belongs to anthropophilic species. Bird hosts are preferred by *Culicoides circumscriptus* (Blackwell et al., 1994) which is a vector of haemosporidia. Within the development cycle of these parasites, biting midges function as a definitive host as well as a vector, which sexually reproduces and further spreads among birds (Garger et al., 2008).

The detection of pathogens in biting midges was carried out applying PCR methods. The presence of haemosporidia was confirmed by the gene sequencing of the cytochrome b region of mt-DNA. Microfilariae of the *Onchocerca* genus were identified based on the detection of gene 18S rDNA ITS-1 (Santiago-Alarcon et al., 2012). In Slovakia, data on molecular identification of pathogens are still absent and the present study is a pilot analysis, or an effort aimed at standardising the method of detection of parasite pathogens in biting midges (*Culicoides*).

Material and methods

In order to confirm the presence of pathogens in *Culicoides* biting midges, we examined 109 females divided into 10 pool samples (Table 1). The molecular analysis was carried out using

parous and pregnant females of five species of biting midges (*C. obsoletus/C. scoticus, C. festivipennis, C. lupicaris, C. punctatus* and *C. circumscriptus*).

Table 1 Description of pool samples of biting midges.

Sample	Biting midge species (Physiological status)	Number of individuals in the sample	Collection site
1.	*C. obsoletus/C. scoticus*/P	20	Rozhanovce
2.	*C. festivipennis*/G	3	Rozhanovce
3.	*C. lupicaris*/P	4	Rozhanovce
4.	*C. obsoletus/C. scoticus*/P	15	Rozhanovce
5.	*C. punctatus*/P	5	Rozhanovce
6.	*C. obsoletus/C. scoticus*/P	25	Rozhanovce
7.	*C. circumscriptus*/P/G	2	Tulčík
8.	*C. circumscriptus*/G	10	Michaľany
9.	*C. circumscriptus*/G	10	Michaľany
10.	*C. circumscriptus*/G	15	Michaľany

P-females that had sucked a host's blood
G-females with eggs in their bellies

Biting midges were collected using a light trap, CDC 1212 model, in Rozhanovce (48°45′00″S 21°21′00″V), Tulčík (49°05′20″S 21°18′45″V), and Michaľany (48°30′50″S 21°37′17″V). The species diagnostics of biting midges was carried out based on characteristic spots on their wings, according to the Dellécole diagnostic key (1985). The sorted samples of biting midges were kept in 70 % ethanol at the Institute of Parasitology of the University of Veterinary Medicine and Pharmacy in Košice.

The first step within the isolation of pathogens from biting midges was the formation of pool samples; the samples included 2 to 25 females of biting midges in one pool sample. Subsequently, the biting midges were homogenised in the buffer solution using plastic pistons. During the experiment, two methods of isolating DNA from biting midges were applied; the isolation using a purification kit; and ethanol DNA extraction. DNAs of biting midges in Samples 1 to six were extracted using the Qiagen Blood & Tissues purification kit, following the manufacturer's instructions. As for Samples 7 to 10, DNA was extracted applying the CTAB method (cetyltrimethylammonium bromide) which is used to extract DNA from tissues (Porebski et al., 1997). In both methods, the samples were incubated for 3 hours at 56 °C.

The samples prepared as described above were then subjected to the detection of the presence of DNA of haemosporidia and Onchocerca. Haemosporidia were identified based on the detection of cytochrome b region of mt-DNA. The used primers included Palu-F (5′-GGG TCA AAT GAG TTT CTG G-3′) and Palu-R (5′-DGG AAC AAT ATG TAR AGG AGT-3′), according to Tang et al. (2010). The detection of Onchocerca was carried out based on the 18S rDNA ITS-1 gene region. The analysis was carried out using primers Fil-1F (5′-CTG CTG TAA CCA TTA CCG AAA GG-3′), Fil-2F (5′-GGT GAA CCT GCG GAA GGA TC-3′), and Fil-2R (5′-TGC TTA TTA AGT CTA CTT AA-′3), according to Martinéz et al. (2009). PCR products were analysed on 1 % agarose gel. The size of the PCR product for haemosporidia was 472 bp. PCR products of microfilariae of *Onchocerca* genus were sized 712-771 bp.

Results and discussion

The DNA extraction, performed using the Qiagen Blood & Tissue commercial kit, facilitated undamaging DNA extraction and good recovery. Extracted DNA was captured on the column. The Qiagen Blood & Tissues extraction kit was also used in the analyses carried out by Svobodová et al. (2007).

DNA extraction by the ethanol method (cetyltrimetylamonium bromide) also facilitated undamaging DNA extraction and good recovery, but DNA precipitated on the test tube wall. This type of extraction is mostly used to isolate herbal extracts and extract DNA from butterflies. The advantage of this method, however, is a relatively low price of chemicals, availability of basic laboratory tools (no special columns are required, as compared to the extraction with commercial kits). This method is shorter and rather easier to perform.

The investigation was carried out using *C. obsoletus/C. scoticus* biting midges collected near pheasants and cloven-hoofed game in Jun and July. Although this species is a vector of Onchocerca (Mullen and Durden, 1993), the samples above were not confirmed to contain DNA of any parasite. Species *C. circumscriptus* and *C. festivipennis* are vectors of haemosporidia in birds (Valkiunas, 2005). Neither these parasites were detected in the examined samples.

Transmission of pathogens is only possible when a biting midge ingests a host‘s blood containing parasites (Garger et al., 2008). The negative result is probably associated with the fact that biting midges were parasitizing hosts that did not carry any parasite pathogens.

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(poster)

Data on crane flies (Diptera: Tipuloidea) of Dagestan (the North East of the Caucasus)

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Key words: Diptera, Tipulidae, Limoniidae, Pediciidae, Dagestan, Caucasus

Introduction

The word *Dagestan* is of Turkish and Persian origin. The Turkish word *dağ* means 'mountain', and the Persian suffix–*stan* means 'land'. However, Dagestan has a variety of natural landscapes that can be divided into five parts - 1 Lowland (a significant part of the territory lies below sea level), 2 The foothills consist of separate ridges running northwest and southeast strike, separated by wide valleys and hollows, 3 Front mountain ridges, 4 The inner mountain Dagestan, 5 Alpine Dagestan includes two main mountain ridges - the Main ridge of the Greater Caucasus (Dagestan belongs to the northern slope) and its Lateral ridge (Dobrynin, 1948; Gurlev, 1972).

Given the extreme eastern location of Dagestan within the North Caucasian mountainous country the study of its entomofauna, is of considerable interest. At the same time, it should be noted that the information on the Tipuloidea of Dagestan is much less complete in comparison with those of other territories of the North Caucasus and especially Transcaucasia.

Previously only eight species of crane flies were known for the territory of Dagestan, according to the collections of the Zoological Museum (Kiev). These are the collections of E. N. Savchenko (1966), V. Logvinenko and V. Ermolenko (1972) and V. Yakushev (1982).

Materials and methods

All recent materials presented in this study were collected by the author. The standard practice of collecting specimens was used: sweeping and collecting, using artificial light.

The main part of material was collected in the Dagestan nature reserve. The first collections of the crane flies were made in the area of the Sarykum dune and in the Samur forest in 2003 and 2004. In subsequent years, the collection of Tipuloidea was carried out as part of the Tembotov Institute of Ecology of Mountain Territories of Russian Academy of Sciences expeditions in the territory adjacent to the Sarykum dune (valley of the Shura-Ozen river), within the Samursky forest (2014, 2016), in Tlyaratinsky (2016), in Agrahan and Kizlyar (2017) sections of the Dagestan reserve. In addition, material was collected on the Gunib Plateau and in the Avarskoy Koysu Valley (2004). This year (2019), collections were made in some areas of South-West (Alpine) Dagestan. For all points at which the material was collected, data are available on geographic coordinates and altitude, and for most, geobotanical descriptions of habitats.

The taxonomical system of Tipuloidea accepts in this study according to The Catalogue of Crane flies of the World by Pjotr Oosterbroek (2019).

Preliminary results

At least 80 species of crane flies have been identified in Dagestan to date – 49 Limoniidae, 4 Pediciidae and 27 Tipulidae. The author's collections include 75 species of which 60 are new to Dagestan, 8 species are new for Russia, 7 new for the Caucasus, and 21 new for the North Caucasus.

Some of this information has already been published (Lantsov, 2009, 2015, 2017, 2018). The genus *Atypophthalmus* and the species *Atypophthalmus* (*Atypophthalmus*) *inustus* (Meigen, 1818) were indicated for the first time in the North Caucasus and Dagestan (Lantsov, 2015). *Cheilotrichia* (*Empeda*) *minima* (Strobl, 1898) was noted as new for Russia and the Caucasus (Lantsov, 2015). The genus *Helius* and the species *Helius* (*Helius*) *pallirostris* Edwards, 1921, *Helius* (*Helius*) *longirostris longirostris* (Meigen, 1818) and *Helius* (*Helius*) *flavus* (Walker, 1856) were also noted for the first time for the Caucasus (Lantsov, 2015). *Pilaria scutellata* (Staeger, 1840) was noted for the first time in Russia, the Caucasus and the North Caucasus. *Symplecta* (*Symplecta*) *grata* Loew, 1873 and *Tipula* (*Lunatipula*) *borysthenica* Savchenko, 1954 were noted as new for the Caucasus and the North Caucasus. *Erioptera* (*Erioptera*) *fuscipennis* Meigen, 1818 was new for the North Caucasus. All these species, as well as *Pseudolimnophila* (*Pseudolimnophila*) *lucorum* (Meigen, 1818) and *Idiocera* (*Idiocera*) *pulchripennis* (Loew, 1856), are new to Dagestan (Lantsov, 2017).

Crane flies from the genus *Hexatoma* - *Hexatoma* (*Eriocera*) *chirothecata* (Scopoli, 1763) were collected in the South-West of Dagestan and indicated for the North Caucasus and Dagestan for the first time – 9♂♂, 3♀♀ (dry specimens). Tsuntinskiy district, 1/5-2 km to NW from village Kitlyarta, N 42° 13' 862", E 45' 47' 481", 1868 m a.s.l., Sabakuniehevy river basin, SW slope near spring, habitat - birch forest with goat willow, 16.07.2019.

The discussion of the results is considered to be still premature, because the part of the materials collected this year, (2019) remain unprocessed. A checklist of crane flies of Dagestan is in preparation.

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The springs – little-known habitats of flies (Diptera) with high conservation value

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Key words: Diptera, faunistics, springs and wells, first and interesting records

Introduction

The springs and wells represent in terms of biodiversity important habitats, often influenced or completely transformed by human activities. The paper summarizes a long-term faunistic survey of four springs: namely Trstenec, Bárka, Olavec, and Podnikvica, situated in the Strážovské vrchy Mountains, which are slightly affected by human activities, but have retained their natural character.

Material and methods

The results summarized in this paper come from several random and extensive surveys of springs and wells in the Strážovské vrchy Mountains, which have been studied under several projects since 2012. Sampling methods are described in detail in Oboňa & Ježek (2014), Dvořák & Oboňa (2014), Oboňa et al. (2015), van der Weele et al. (2015, 2017, 2018), and Negrobov et al. (2019). (Identifiers of individual families: Psychodidae – J. Ježek; Drosophilidae – J. Máca; Dolichopodidae – O. P. Negrobov; Limoniidae, Pediciidae, and Ptychopteridae – J. Starý; Empididae and Hybotidae – R. van der Weele).

Results and discussion

During a seven-year research, we have recorded, for the fauna of Slovakia, nine first records of flies belonging to the families Psychodidae: *Jungiella* (*Jungiella*) *hygrophila* Ježek, 1987, *Jungiella* (*Jungiella*) *valachica* (Vaillant, 1963), and *Jungiella* (*Psychocha*) *laminata* (Szabó, 1960) (Oboňa & Ježek 2014), Empididae: *Dolichocephala ocellata* (Costa, 1854) (van der Weele et al. 2017), Hybotidae: *Platypalpus optivus* (Collin, 1926), *Platypalpus sloveniensis* Bequaert, 1962, and *Tachypeza tanaisense* Kovalev in Chvála, 1975 (van der Weele et al. 2015, 2018), and Dolichopodidae: *Teuchophorus simplex* Mik, 1880 and *Telmaturgus simplicipes* (Becker, 1908) (Negrobov et al. 2019). We have also confirmed the presence of many uncommon and rare species of several Diptera families: e.g. Limoniidae: *Elliptera hungarica*

Madarassy, 1881, *Limonia pannonica* (Kowarz, 1868), *Lipsothrix remota* (Walker, 1848), Pediciidae: *Pedicia* (*Crunobia*) *pallens* Savchenko, 1978), Ptychopteridae: *Ptychoptera handlirschi* (Czižek, 1919), *P. longicauda* (Tonnoir, 1919), Drosophilidae: *Amiota rufescens* (Oldenberg, 1914; second record for Slovakia), Psychodidae: *Pericoma* (*P.*) *pingarestica* Vaillant, 1978), and many others (e.g. Dvořák & Oboňa 2014, Oboňa et al. 2015).

It is evident, that springs and wells represent important habitats with a specific (island) biodiversity, that deserve proper protection, since even relatively small interventions to these sites may have a destructive impact on these ecosystems and may lead to the disappearance of their diversified communities.

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(poster)

To the knowledge of biodiversity of selected fly families (Diptera) of Transcaucasia, with special emphasis on the families Limoniidae and Pediciidae

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Key words: Armenia, Azerbaijan, Georgia, faunistics, Diptera

Introduction

The Transcaucasian region is of particular interest in terms of biodiversity worldwide. It is one of the 35 richest and most endangered sites in the world – "biodiversity hotspots" with an extraordinary wealth of endangered and endemic species (e.g. Myers et al. 2012). However, from Diptera biodiversity point of view, the Transcaucasian area (Armenia, Azerbaijan, and Georgia) is insufficiently investigated (Oboňa et al. 2017a).

Material and methods

The results summarized in this paper come from three expeditions: Armenia (from 26 August to 4 September 2015; more information in Oboňa et al. 2016), Azerbaijan (from 26 May to 6 June 2017; more information in Starý et al. 2017), and the last expedition in Azerbaijan and Georgia (from 14 to 24 September 2018; more information in Oboňa et al. 2019).

Results and discussion

From the territory of Armenia, 50 species of the family Limoniidae and 5 species of the family Pediciidae were known until 2015 (Oosterbroek 2019, updated 24 September 2015). Overall, we managed to record and publish 27 first records of the family Limoniidae and one of the family Pediciidae. This has increased the current state of biodiversity knowledge of these families for Armenia to 77 and 6 species, respectively (Oboňa et al. 2016, Oosterbroek 2019).

From the territory of Azerbaijan, 92 species of the family Limoniidae were known until 2017 (Oosterbroek 2019, updated 9 November 2017). This number was increased by five new species to local fauna to 97 (Starý et al. 2017), later by two others (Oboňa et al. 2019) and a newly described species *Molophilus* (*Molophilus*) *soldani* (Starý & Oboňa, 2019) to the current state 100 species of the family Limoniidae for the territory of Azerbaijan.

From the territory of Georgia, a total of 125 species of the family Limoniidae and 14 species of the family Pediciidae were known until 2018 (Oosterbroek 2019). These numbers have been currently increased for the family Limoniidae by 4 first records to 129 species and for the family Pediciidae by one first record to 15 species (Oboňa et al. 2019).

New information on biodiversity of the Diptera families Anisopodidae, Bibionidae, Blephariceridae, Campichoetidae, Dixidae, Dolichopodidae, Lonchopteridae, Psychodidae, and Scatopsidae of Transcaucasia are summarized in the papers by Hrivniak et al. (2018), Ježek et al. (2018), Negrobov et al. (2017, 2019), and Oboňa et al. (2017 a,b).

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