UNIVERSITY OF PÉCS

Biological Doctoral School

Highly variable abiotic environment induced changes in taxonomic and functional composition of headwater insect assemblages within a small mountain range

PhD Thesis

Ildikó Szivák

Supervisor:

Dr. Zoltán Csabai

PhD

PÉCS, 2013

UNIVERSITY OF PÉCS

Biological Doctoral School

Highly variable abiotic environment induced changes in taxonomic and functional composition of headwater insect assemblages within a small mountain range

PhD Thesis

Ildikó Szivák

Supervisor:

Dr. Zoltán Csabai

PhD

PÉCS, 2013

INTRODUCTION

The community ecology is one of the fast developing disciplines in ecology, which object is the community structured by the spatially and temporally co-occurring populations. The most important questions of community ecology focus on the structure and the functioning of communities in different ecosystems. The main aim of structural studies is to explore the spatial and the temporal distribution patterns of communities. While studying the functioning of communities provides insight to the functional role of species structuring assemblages and their contribution power to the subsistence and the stability of communities.

The fluvial ecosystems provide unique environment for the inhabiting biota, therefore the ecology of fluvial ecosystems, as an independent academic discipline applies its own theoretical frameworks and methodologies. Running waters are opened, dynamic systems, continuously change in time and space, and connected with each other through the high connectivity of lateral, longitudinal and vertical water flow. As a matter of fact they are really complex systems characterized by flow dependent shifting mosaics of channel features, habitat units, surface and subsurface zones, floodplains and riparian corridors in which the diversity of these physical templates determine the setting in which communities inhabit and ecological processes interact. Consequently, the functioning of running waters can be explored deeper by studying them within larger spatial extent, for example within their valley or their catchment. This perspective highlighted a theory in which the community structures of fluvial ecosystems are assembled by the organisms that are adapted to factors influencing in hierarchically nested spatial scale, and refined by interspecific interactions.

In freshwater ecosystems the macroinvertebrate assemblages have important role in nutrient cycling (e.g. they are detritivors, food of several predators etc.). The freshwater insect communities are structured by abiotic (physiochemical features of habitats) and biotic (direct and indirect interspecific interactions) factors through direct and indirect ecological processes. The abiotic factors determine the quality of freshwater habitats and the biological interactions between species. Thus these factors constrain which species could coexist within the same habitat. Consequently, the species composition and the abundance of freshwater insects could indicate the ecological condition of habitats.

It is well known that freshwater macroinvertebrates respond quickly to disturbances and environmental heterogeneity even at small spatial scales. Even so, in the case of temperate, continental streams only few investigation studied the responses of freshwater macroinvertebrate

assemblages to highly variable abiotic environment exist within small geographical distances (e.g. within sub-catchment). This environmental heterogeneity and the dynamics of disturbances determine what combinations of behavioural, physiological and life history characteristics are appropriate for local persistence. Thus direct matches can be assumed between traits (functional composition of assemblages) and the physicochemical environment. Consequently, analysing the functional composition of assemblages provides precious information about the ecological condition of, and processes in streams.

Several studies showed that the range of behavioural and physiological tolerances varies among freshwater insect species in lotic habitats. Interspecific differences in tolerance and in ecological traits could reflect the historical and the phylogenetic constraints and the adaptation to particular environmental circumstances. Therefore, the effect of regional and local environmental factors can vary among taxa (e.g. species or species group) having different traits. Although several studies could highlighted the differences between EPT (Ephemeroptera, Plecoptera, Trichoptera) and ColH (Coleoptera, Heteroptera) assemblages associated with their ecological aspects, only few data is available on differences between the regional and the local environmental factors which determine the structures of two insect groups having different and specific ecological traits.

The non-biting midges (Diptera: Chironomidae) has important ecological role within the macroinvertebrate assemblages due to be the most diverse, and often the most abundant insect family in lotic ecosystems. Furthermore, they occupy a wide variety of habitats and strongly respond to environmental heterogeneity, since most genera include species with different ecological traits. Thus similarly to other macroinvertebrate groups the chironomids are good indicator of natural environmental gradients and anthropogenic impacts. Even so, little information is available about the role of regional and local abiotic environmental factors in structuring the taxonomic and the functional composition of chironomid assemblages in streams.

AIMS

The main aim of the doctoral thesis was to explore the highly variable abiotic environment induced changes in taxonomic and functional composition of headwater insect assemblages within a small and environmentally heterogeneous mountain range (Mecsek Mountains).

1) We investigated the differences between the taxonomic and the functional composition of headwater insect assemblages with respect to their responses to the highly variable environment, and their seasonal distributional variation within a small mountain range, where highly variable abiotic condition exists among second-order headwater streams. Our aim also was to assess the seasonality and the spatial factors influencing at hierarchically nested spatial scale structuring the taxonomic and the functional compositions of headwater insect assemblages. Based on previous studies we hypothesised that functional classification did not provided more insight regarding community–habitat relationships than taxonomic classification.

2) Besides, we studied the differences between taxa groups having different ecological traits (EPT, ColH) regarding their responses to abiotic environmental heterogeneity (spatial, local and regional factors), seasonality and the spatial factors influencing at hierarchically nested spatial scale structuring their composition. We assumed distinctive differences by analysing separately the two taxa groups (EPT, ColH) regarding their response to the variable abiotic environment.

3) Since the non-biting midges (Diptera: Chironomidae) are significant members of the macroinvertebrate assemblages, we studies separately the taxonomic and the functional composition of their larval assemblages and their response to environmental heterogeneity. We also search the significant temporal and spatial factors structuring the composition of their assemblages. We assumed that the taxonomic and the functional composition of chironomid larvae respond strongly to natural environmental gradients and anthropogenic impacts similarly to other macroinvertebrate groups, since most genera include species with different ecological traits.

MATERIAL AND METHODS

Study area, sampling locations and dates

The survey area is located in the Mecsek Mountains, which is one of the most southern mountain ranges in the Carpathian Basin. It is considerably isolated from other mountain regions (e.g. Zselic, Völgység) and surrounded by plains and low hilly territories (e.g. Szigetvidék, Dráva-mellék, Ormánság). This relatively small (350 km^2) mountain range is really heterogenic regarding geology and climatic condition.

Samples were taken at 10 locations at second-order and near-pristine stream sections from 8 streams. We chose three streams (Bicsérdi stream, Bodai stream, Petőci stream) from the south-western region which belong to the sub-catchment of river Dráva. While, the other seven sampling locations belong to the sub-catchment of river Danube. Six out of them (Hidasi valley upstream and downstream section, Ól valley, Réka valley, Vár valley at Iharos sping and Máré spring) located at the north-eastern region, while one (Vízfő spring) located at the north-western region of the mountain range. Each site was sampled three times in 2009 (6-20.05.2009., 21-25.07.2009., 19-23.10.2009.) and once in 2010 (27-31.03.2010.).

Sampling procedure

Aquatic insects were quantitatively collected according to the **A**ssessment System for the Ecological **Q**uality of Streams and Rivers throughout **E**urope using Benthic **M**acroinvertebrates (AQEM) protocol which focuses on a multihabitat scheme designed for sampling major habitats in proportion to their presence within 100m long sampling reaches. A sample consists of 20 ‘sampling units’ taken from microhabitat types at the sampling site. The 20 ‘sampling units’ were distributed according to the proportion of microhabitats. A ‘sampling units’ was taken from a 0.25x0.25 m^2 area by ‘kick and sweep’ method using a handnet (0.25x0.25 m frame size, 1 mm mesh size). After collection, each 'sampling unit' was fully and accurately sorted into sampling bottles in the field keeping them separate from each other. Samples were preserved in 70% ethyl-alcohol and returned to the laboratory for examination.

Studies aquatic insect taxa

Most of the individuals were identified to species or subspecies level in the case of the major part of studied genera. While dipteran samples with one exception (Chironomidae) were identified in family level. The identification of specimens was taken by taxonomist.

Spatial and abiotic environmental variables

The measured abiotic environmental variables were divided into three main groups: 1) spatial factors, 2) local scale environmental variables and 3) regional scale environmental variables.

1) To allow the recognition of spatial trends two spatial variables (x and y geo-coordinates) were involved our analyses. The pure spatial component explains spatial patterns of species data that are not shared by any of the measured environmental data. These patterns could be caused by some biological process without relation to the environmental variables that were measured in the study.

2) At each site, 43 local scale environmental variables were taken in all seasons related to streambed morphology (18), physicochemical attribute (15) and riparian vegetation (10).

3) The climatic condition of sampling sites were characterized by the latest 30 years' mean data of climatic parameters related to the temperature and the precipitation (18 climatic parameters). Hydrological conditions of sampling locations were also determined using five parameters (slope, aspect, altitude, streamline distance of the sites from source, size of drainage area above the sampling site). While the geological feature of stream sections were characterized by the coverage of bedrock types (red sandstone, limestone, volcaniclastic rocks, fine-grained sedimentary rocks) at the drainage area above the sampling site.

Species traits

We considered two main traits to characterize the functional composition of assemblages (locomotion types and functional feeding groups). These traits are highly influential for functional organisation of freshwater macroinvertebrate assemblages.

Data analysis

Constrained ordination methods (Redundancy Analysis – RDA) were applied to assess the differences between the taxonomic and the functional composition of insect and chironomid assemblages, and the EPT and ColH assemblages regarding their response to abiotic environmental heterogeneity. Forward selection procedures were carried out to ranking environmental variables by their conditional effects of assemblages. Variables were individually tested within their groups and selected according to the following criteria: explaining more than 4% of the total variance in biotic datasets, and having significant (α=0.05) effect on the distribution patterns of assemblages based on Monte Carlo permutation tests (999 permutations). To determine the relative influence of spatial patterns and the measured environmental variables (regional and local), the total variance was partitioned to the proportion attributed to spatial, local and regional environmental variables and

their interactions (partial Redundancy Analysis – pRDA). The RDA and pRDA procedures were carried out with software CANOCO ver. 4.5.

Permutational multivariate analyses of variance using distance matrices (ADONIS) were used to test for differences in the composition of insect, EPT, ColH and chironomid assemblages in a nested hierarchical design accounting for 1) microhabitats 2) within streams 3) within catchments and separate sampling times. For these analyses, we contracted the nine microhabitat types into four wider microhabitat groups. We examined the differences of the taxonomic and the functional composition of assemblages between microhabitats, sites, catchments and seasons using Discriminant Analysis of Principal Components (DAPC). In the case of both analyses (ADONIS, DAPC) we used the abundance data of species and the relative frequencies of traits as variables, the sampling occasions (microhabitat group × sampling site × sampling time) as objects, and finally catchment (2 levels), stream section (10 levels), microhabitat group (4 levels) and sampling time (4 levels) as grouping variables. These statistical analyses were performed with software R ver. 2.14.0 using the packages 'vegan' for ADONIS and 'adegenet' for DAPC.

RESULTS

Faunistical data

A total of 23571 specimens belonging to 160 taxa were found during our one-year investigation. We gave the first occurrences of 39 species (4 Ephemerotera, 2 Plecoptera, 1 Heteroptera, 14 Coleoptera and 18 Chironomidae) from the Mecsek Mountains. We also provided the first Hungarian occurrence of *Limnius opacus* (Coleoptera) and *Paratrichocladius skirwithensis* (Chironomidae).

The response of headwater insect assemblages to abiotic environmental heterogeneity

We found that abiotic habitat features related to water chemistry (e.g. pH), the concentration of several ions (e.g. phosphorus and ammonium ion), streambed morphology (e.g. the number of pools in 100 m reach), the size of stream section (distance from source) and climatic condition (e.g. the precipitation of driest month) significantly explained the variation in the taxonomic and the functional composition of headwater insect assemblages. The taxonomic composition showed strong respond to the seasonal gradient characterized by the variation in percentage proportion of two microhabitat types (akal, fine particulate organic matter). While distinctive seasonal pattern of functional composition was not recognized. Beside seasonality a natural environmental gradient related to the longitudinal position of stream sections (distance from source) and geographically

variable climatic conditions (the precipitation of driest month) significantly contributed to the variation of both the taxonomic and the functional composition of assemblages. Based on RDA analyses the selected environmental variables had much more higher relative influence on the distribution patterns of the functional (65.8%) than the taxonomic (53.9%) composition. The results of pRDA analyses indicated that local environmental variability showed more important role in structuring the taxonomic than the functional composition of assemblages. While, the variability of regional variables were more effective than the local factors regarding their explained amount of variance in functional composition of assemblages. Both compositions showed significant, but weak spatial structure within the mountain range.

Spatial variability in the taxonomic and the functional structure of headwater insect assemblages was examined at multiple scales (i.e. from microhabitat to catchment). The influence of microhabitat level (microhabitat within streams within catchment) was the most important in structuring the taxonomic and the functional composition of assemblages. Different headwater insect assemblages were found among the different microhabitats studied within higher inclusive levels of spatial organization.

Differences between taxa groups having different ecological traits (EPT, ColH) regarding their responses to abiotic environmental heterogeneity

Distinctive differences could be pointed out between EPT and ColH assemblages regarding their responses to the variability of chemical features of the water, streambed morphology, the structure of riparian vegetation, hydrological and climatic condition of habitats. EPT assemblages responded strongly to the seasonal gradient characterized by variation in the concentration of phosphate ion, hydrogen carbonate ion and one microhabitat type (akal). Besides we showed the significant influence of several factors indicated the streambed heterogeneity (e.g. frequency of riffles and pools) and the structure of riparian vegetation. These abiotic habitat characteristics strongly differentiate the EPT assemblages inhabiting the closed, meandered streams having wide valley floor from opened streams running straight and characterized by low internal physical heterogeneity. The seasonal variability of environmental variables did not show significant effect on ColH assemblages. The distribution patterns of ColH communities were determined by the longitudinal position of stream sections (distance from source), the water chemistry and the climatic condition of habitats (precipitation of driest month). Based on pRDA analyses local environmental variables were more important for EPT than ColH structure.

We did not found differences between EPT and ColH assemblages with respect to variation in

their spatial distribution patterns using hierarchically nested spatial scale from microhabitat to catchment. The internal microhabitat heterogeneity played a major role in structuring the taxonomic patterns of both the EPT and the ColH assemblages. Thus differences can be found between the taxonomic composition of EPT and ColH assemblages inhabiting the different microhabitats studied within higher inclusive levels of spatial organization.

Relationships between the chironomid assemblages and their abiotic habitat features

The distribution patterns of the taxonomic composition of chironomid larvae assemblages was significantly explained by physicochemical feature of water, the concentration of organic matters, the instream heterogeneity, forest coverage at the riparian zone and the valley floor, and the coverage of limestone bedrock similarly to other macroinvertebrate groups. Contrary to the whole insect assemblages the taxonomic composition of chironomid assemblages was not significantly affected by seasonal variability of environmental variables. Their functional composition was significantly determined by the temperature annual range and the y geo-coordinate (longitude). Further four abiotic variables (the structure and the naturalness of riparian vegetation, the number of wood in the stream section, the coverage of fine-grained sedimentary rocks) contributed significantly to the explained variance of functional composition. These factors changed along the gradient related to the geographical location of sites and the naturalness of habitats and strongly affected on the functional composition.

Based on pRDA analyses local environmental variability was more effective in structuring the taxonomic than the functional composition of chironomid assemblages similarly to other macroinvertebrate groups. The taxonomic composition did not, while the functional compositions weakly structured in space within the mountain range.

Microhabitat level (microhabitat within streams within catchment) explained the highest percentage of variance in the datasets of taxonomic composition and it was not effective on the functional composition. The influence of stream level (streams within catchment) was the most important in structuring the functional structure. Different assemblages were found among the different microhabitats studied within higher inclusive levels of spatial organization.

DISCUSSION

Faunistical data

We gave the first occurrences of 39 species from the Mecsek Mountains and the first faunistical data from several streams. We gave the first larval data of caddisfly species from the mountain. We also provided further faunistical data to several rare, protected or vulnerable species (e.g. *Limnius opacus*, *Ecdyonurus submontanus*, *Cordulegaster heros*) from Hungary.

The response of headwater insect assemblages to abiotic environmental heterogeneity

Several studies revealed that the functional and the taxonomic characterisation of stream macroinvertebrate communities would provide similar insight regarding community–habitat relationships across both small and wide spatial extent. Contrary this findings, we found differences between the taxonomic and the functional composition of stream insect assemblages regarding their responses to the highly variable environment within a small mountain range in Mecsek Mountains.

The abiotic environmental gradient connected to the longitudinal position and the climatic condition of stream sections significantly explained the variation in patterns of the taxonomic and the functional composition. In our study, the seasonal variation in the taxonomic composition was not followed by the functional structure of assemblages, since the species-specific replacements within functional groups were likely not only in space, but in time too.

In contrast of our hypothesis, functional classification provided more insight regarding community–habitat relationships than taxonomic classification. Within small geographical ranges this phenomenon may be caused by the strong influence of stochastic colonisation events on community structure, or high variation in dispersal abilities among species. The rugged topography and steep gradient in abiotic environment are leading to partial isolation of sites, which may strengthen the influence of stochastic historical events on the current community structure.

We revealed high variation in the climatic, the hydrological and the geological conditions of the studied stream sections. Over evolutionary time, these abiotic constraints are expected to have selected for certain functional traits that are suited for long term survival. Presumably, these processes resulted that regional environmental variability showed important role in structuring the functional composition of headwater insect assemblages in Mecsek Mountains. While, the assemblages could adapt to the seasonal variability of local environmental conditions through the seasonal species replacements.

We revealed that the importance of microhabitat affinity was strong enough to arise over

abiotic constrains influenced at higher spatial scales. Several previous studies pointed out that the microhabitat type has a finer scale effect in structuring macroinvertebrate assemblage through providing a diversity of sites for food acquisition, reproduction and development, as well as refuge from predators and disturbances.

Differences between taxa groups having different ecological traits (EPT, ColH) regarding their responses to abiotic environmental heterogeneity

Based on our study, fine and distinctive differences could be pointed out by analysing separately the assemblages having different ecological traits (EPT, ColH) regarding their responses to the variation in the abiotic environment.

The seasonal variability of local environmental variables showed significant effect on the EPT. Their composition showed strong seasonal variability, which could not be observed in the case of ColH assemblages. The distribution patterns of ColH communities were determined by the longitudinal position, the water chemistry and the climate conditions of stream sections. Several previous studies revealed that seasonal variation in local environmental characteristics could determine the ecological quality of the habitats utilized by the EPT larvae and imagines. For example, the high instream heterogeneity have fundamental importance in shaping the EPT larval assemblages through providing refuges against temporal disturbances like floods and droughts. Since using drift their dispersal abilities are weak contrary to the ColH taxa.

Interesting result that the pure spatial factors could explain twice much variability in the case of EPT distribution than in the case of ColH distribution. Since the ColH taxa have better dispersal abilities than the EPT species, we expected the opposite relationship between spatial factors and distribution patterns of taxa groups. Our findings were likely caused by the high abundance of the bad flyers Coleoptera taxa (e.g. Elmidae, Hydraenidae) inhabiting the studied stream sections.

We revealed that the instream heterogeneity had stronger effect on the distribution patterns of the EPT than the ColH assemblages. Even so, comparing the assemblages having different ecological traits, in the both case the importance of microhabitat affinity was strong enough to arise over the abiotic constrains influenced at higher spatial scales. This phenomenon was likely caused by the high diversity of functional feeding groups using the both taxa group. Thus similar differences can be found between microhabitats providing sharply distinct feeding opportunities.

Relationships between the chironomid assemblages and their abiotic habitat features

We highlighted that the taxonomic and the functional composition of chironomid larvae respond strongly to natural environmental gradients (e.g. climatic gradient, seasonality) and anthropogenic impacts (e.g. organic pollution) similarly to other macroinvertebrate groups. Besides, we could reveal new relationships between abiotic environment and biological patterns by analysing separately the chironomid assemblages.

We detected a distinct and specific seasonal dynamics in the taxonomic composition of chironomid assemblages, in which species having different phenology continuously replaced each other during the studied year. Consequently, we could not describe sharp segregation between the taxonomic compositions of different seasons. The functional structure showed strong response to altering climatic condition and ecological quality of habitats. Contrary of whole insect assemblages, we did not found significant relationship between the distributional pattern of functional structure of chironomid assemblages and the longitudinal position of stream sections.

We highlighted that within a small mountain range the good flyer taxa could follow the highly variable environmental conditions. Therefore, within small geographical area the adaptation to varying local environment could play crucial role in structuring the taxonomic and the functional composition of chironomid assemblages.

Among the stream insects only the chironomids showed strong response to anthropogenic impacts (e.g. organic pollution) which was observed in the Bicsérdi stream in 2009 summer. In autumn we observed the high amount of shredders after the pollution, furthermore one of them (*Brillia bifida*) had population boom. Since, the specimens of *Brillia bifida* were in adult or egg stage during summer; thus, could survive the pollution. Then in autumn due to allochton input the availability of their food source had raised. Besides, we observed the lack of gammarid (*Gammarus fossarum*) competitors which could colonize slowly the sites after the pollution again. Therefore, the shredder chironomid species could utilize new habitat patches characterized by rich food sources and the lack of strong competitors.

During our investigation, we did not found differences between the functional structures of assemblages inhabiting the different microhabitat types. Since chironomid species belonging to similar feeding types utilized different microhabitat types.

We highlighted that in the Mecsek Mountains headwater insect assemblages showed strong and diverse response to a gradient defined by rapid and significant changes in abiotic environment within a small geographical range. Besides local abiotic habitat characteristics, the climatic and the geological conditions of habitats were highly variable in the studied area. Therefore, the adaptation to altering abiotic conditions played an important role in structuring the taxonomic and the functional composition of assemblages. Consequently, we observed that the functional and the taxonomic characterisation of stream insect assemblages would provide similar insight regarding community–habitat relationships across small spatial extent. The upper sections of streams could be highly isolated and the inhabiting taxa could be really different regarding their dispersal ability. Thus beside adaptation, dispersal limitation could have an important role in structuring headwater insect communities at small spatial extent. With our study we emphasise that the relationships between headwater insect community and ecological processes in the Carpathian Basin characterized by not only the diverse human population, but the highly variable abiotic environment could be really distinct from the other part of Europe (e.g. Scandinavian Peninsula).

PUBLICATIONS

Publications related to the thesis

Szivák I., Móra A., Méhes N., Bereczki Cs., Ortmann-Ajkai A. & Csabai Z. (2013): Highly variable abiotic environment induced changes in taxonomic and functional composition of headwater chironomid assemblages within a small mountain range. *Fundamental and Applied Limnology* 182: 323–335. **(IF:1.190)**

Szivák I. & Csabai Z. (2012): Are there any differences between taxa groups having distinct ecological traits based on their responses to environmental factors? *Aquatic Insects* 34 Suppl. 1: 173–187. **(IF: 0.358)**

Méhes N., **Szivák I.**, Csabai Z. & Móra A. (2012): Contribution to the Chironomidae (Diptera) fauna of the Mecsek mountains. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 28: 121–128.

Boda R., Rozner Gy., Czirok A., **Szivák I.**, Csabai Z. (2011): New data on the distribution of *Cordulegaster heros* Theischinger, 1979 in Mecsek mountains and its surroundings. *Acta Biologia Debrecina, Supplementum Oecologica Hungarica* 26: 21–28.

Szivák I., Deák Cs., Kálmán Z., Soós N., Mauchart P., Lőkkös A., Rozner Gy., Móra A. & Csabai Z. (2010): Contribution to the aquatic macroinvertebrate fauna of the Mountains Mecsek with the first record of *Limnius opacus* P.J.W. Müller, 1806 in Hungary. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 21: 197–222.

Mauchart P., Méhes N., Deák Cs., Móra A., **Szivák I.** & Csabai Z. (2010): Kérészek, álkérészek és tegzesek faunisztikai adatai a mecseki vízterekből. *Hidrológiai Közlöny (Journal of Hungarian Hydrological Society)* 90: 100–102.

Méhes N., Kovács T.Z., & **Szivák I.** (2010): Diptera családok tér- és időbeli előfordulási sajátosságai mecseki patakokban lárva adatok alapján. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 21: 115–125.

Kálmán Z., Soós N., Kovács T.Z., Szappanos D., Horváth O., **Szivák I.** & Csabai Z. (2010): Vízibogarak és vízipoloskák faunisztikai adatai mecseki vízterekből. *Hidrológiai Közlöny (Journal of HungarianHydrological Society)* 90: 50–52.

Oral and poster presentation related to the thesis

Szivák I., Móra A., Méhes N., Bereczki Cs., Ortmann-Ajkai A. & Csabai Z.: Taxonomic and functional composition of headwater chironomid assemblages in a small, geologically and environmentally heterogeneous mountain range. *Fresh Blood for Fresh Water, Aquatic Young Science Conference*, 27.02. – 01.03.2013, Lunz am See, Austria (poster presentation).

Bereczki Cs., **Szivák I.** & Csabai Z.: Surveying microhabitat preference of aquatic macroinvertebrates. *Fresh Blood for Fresh Water, Aquatic Young Science Conference*, 27.02. – 01.03.2013., Lunz am See, Austria (poster presentation).

Mauchart P., **Szivák I.** & Csabai Z.: Két bolharák faj (Crustacea, Gammaridae) habitat preferenciájának és biotikus interakcióinak vizsgálata mecseki vízterekben. *9. Magyar Ökológus Kongresszus*, 5-7.09.2012., Keszthely, Hungary (oral presentation).

Bereczki Cs., Herczeg R., **Szivák I.** & Csabai Z.: Vízi makrogerinctelen közösségek vizsgálata metaközösségi mutatók segítségével. *9. Magyar Ökológus Kongresszus*, 5-7.09.2012., Keszthely, Hungary (poster presentation).

Méhes N., **Szivák I.**, Csabai Z. & Móra A.: Árvaszúnyog (Diptera: Chironomidae) együttesek szerkezete különböző alapkőzeten futó hegyvidéki patakokban. *9. Magyar Ökológus Kongresszus*, 5-7.09.2012., Keszthely, Hungary (poster presentation).

Szivák I. & Csabai Z.: A biológiai jellemvonások és az abiotikus környezet közötti kapcsolatok vizsgálata hegyvidéki patakok makrogerinctelen közösségein. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Méhes N., Móra A., **Szivák I.** & Csabai Z.: Árvaszúnyog (Diptera: Chironomidae) együttesek szerkezete különböző alapkőzeten futó hegyvidéki patakokban. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Ortmann-Ajkai A., Bereczki Cs., Boda R., **Szivák I.** & Csabai Z.: Metaközösség-vizsgálatok SDR Simplex módszerrel mecseki patakokban. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Méhes N., **Szivák I.**, Csabai Z. & Móra A.: Adatok a Mecsek árvaszúnyog (Diptera: Chironomidae) faunájához. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (poster presentation).

Bereczki Cs., **Szivák I.**, Boda R. & Csabai Z.: Aquatic macroinvertebrate assemblage variation among seasons, sites and microhabitats. *7th Symposium for European Freshwater Sciences,* 27.06 – 01.07.2011., Girona, Spain (poster presentation).

Szivák I. & Csabai Z.: Mennyiben különböznek az EPT és bogár, poloska közösségek a környezeti faktorokra adott válaszaik alapján? *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (oral presentation).

Bereczki Cs., **Szivák I.**, Móra A & Csabai Zoltán: Vízi makrogerinctelenek mikrohabitat szelekciója: Milyen tényező befolyásolja a legjobban a közösségek kialakulását? *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (oral presentation).

Boda R., Rozner Gy., Czirok A. **Szivák I.** & Csabai Z.: A kétcsíkos hegyi szitakötő (*Cordulegaster heros* Theischinger, 1979) előfordulása a Mecsekben és környékén. *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (oral presentation).

Mauchart P., **Szivák I.** & Csabai Z.: Bolharák fajok (Crustacea, Gammaridae) koegzisztencia viszonyait befolyásoló környezeti tényezők vizsgálata. *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (oral presentation).

Méhes N. & **Szivák I.**: Milyen környezeti tényezők befolyásolhatják a kétszárnyú (Diptera) lárvák elterjedését mecseki kisvízfolyásokban? *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (poster presentation).

Szivák I. & Móra A.: Tegzes közösségek mintázatát alakító környezeti tényezők vizsgálata különböző ökológiai állapotú kisvízfolyásokban. *LII. Hidrobiológus Napok,* 06-08.10.2010., Tihany , Hungary (oral presentation).

Ortmann-Ajkai A., **Szivák I.** & Csabai Z.: Stream macroinvertebrate and vegetation: do they live in the same environment? *IX. European Congress of Entomology*, 22-27.08.2010., Budapest, Hungary (poster presentation).

Szivák I. & Csabai Z.: Are there any differences between the EPT and Coleoptera, Heteroptera assembalges in their responses to environmental factors? *IX. European Congress of Entomology*, 22-27.08.2010., Budapest, Hungary (poster presentation).

Bereczki Cs., **Szivák I.**, Móra A. & Csabai Z.: Microhabitat preference of stream macroinvertebrates. *IX. European Congress of Entomology*, 22-27.08.2010., Budapest, Hungary (oral presentation).

Szivák I., Deák Cs., Kálmán Z., Soós N., Mauchart P., Lőkkös A., Rozner Gy. Móra A. & Csabai Z.: Adatok a Mecsek-hegység víztereinek vízi makrogerinctelen faunájához és *a Limnius opacus* első hazai előfordulása. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Szivák I., Kovács T.Z. & Csabai Z.: Mecseki patakok vízirovar fajegyüttesei térbeli mintázatának

vizsgálata. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Bereczki Cs., **Szivák I.**, Móra A. & Csabai Z.: Mikrohabitat preferencia vizsgálatok kisvízfolyások makrogerinctelen élőlény együttesein. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Mauchart P. & **Szivák I.:** *Gammarus roeseli* és *G. fossarum* fajok koegzisztencia vizsgálata mecseki patakokban. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (poster presentation).

Méhes N., Kovács T.Z. & **Szivák I.**: Diptera családok tér- és időbeli elfordulási sajátosságai mecseki patakokban lárvaadatok alapján. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Mauchart P., Méhes N., Deák Cs., Móra A., **Szivák I.** & Csabai Z.: Kérészek, álkérészek és tegzesek faunisztikai adatai a mecseki vízterekből. *LI. Hidrobiológus napok*, 09.30 – 10.02.2009., Tihany, Hungary (poster presentation).

Kálmán Z., Soós N., Kovács T.Z., Szappanos D., Horváth O., **Szivák I.** & Csabai Z.: Vízibogarak és vízipoloskák faunisztikai adatai mecseki vízterekből. *LI. Hidrobiológus napok*, 09.30 – 10.02.2009., Tihany, Hungary (poster presentation).

Other publications

Kučinić M., **Szivák I.**, Pauls S.U., Bálint M., Delić A. & Vučković I. (2013): *Chaetopteryx bucari* sp. n., a new species from the *Chaetopteryx rugulosa* group from Croatia (Insecta, Trichoptera, Limnephilidae) with molecular, taxonomic and ecological notes on the group. ZooKeys 320: 1–28. **(IF: 0.864)**

Bereczki Cs., **Szivák I.**, Móra A. & Csabai Z. (2012): Variation of aquatic insect assemblages among seasons and microhabitats in Hungarian second-order streams. *Aquatic Insects* 34 Suppl. 1: 103–112. **(IF: 0.358)**

Csabai Z., Kálmán Z., **Szivák I.** & Boda P. (2012): Diel flight behaviour and dispersal patterns of aquatic Coleoptera and Heteroptera species with special emphasis on the importance of seasons. *Naturwissenschaften* 99: 751–765. **(IF: 2.144)**

Móra A. & **Szivák I.** (2012): Spatial distribution and diversity of chironomid (Diptera: Chironomidae) assemblages in a small hilly stream. *Aquatic Insects* 34 Suppl. 1: 127–138. **(IF: 0.358)**

Oláh J., Kovács T., Sivec I., **Szivák I.** & Urbanic G. (2012): Seven new species in the *Chaetopteryx rugulosa* species group: applying the phylogenetic species concept and the sexual selection theory (Trichoptera, Limnephilidae). *Folia Historico Naturalia Musei Matraensis* 36: 51–79.

Szivák I., Móra A. & Török J.K. (2011): Spatio-temporal variations of caddisfly assemblages in a chalk stream, Balaton Upland, Hungary. *Zoosymposia* 5: 439–452.

Móra A., **Szivák I.**, Deák Cs., Boda R., Csabai Z., Sály P., Takács P., Erős T. & Bíró P. (2011): Environmental factors influencing the distribution of EPT assemblages in streams of Lake Balaton's catchment area, Hungary. *Zoosymposia* 5: 360–371.

Kálmán A., Boda R., Kálmán Z., Mauchart P., Rozner Gy., **Szivák I.**, Soós N. & Csabai Z. (2011): Contribution to the aquatic macroinvertebrate fauna of the Zselic hilly region, SW Hungary. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 26: 99–115.

Szivák I., Móra A., Deák Cs., Kálmán Z., Soós N., Boda R., Kovács T.Z., Sály P., Takács P., Csabai Z., Erős T. & Bíró P. (2010): Makroszkopikus vízi gerinctelen szervezetek térbeli előfordulási sajátosságait befolyásoló közvetlen élőhelyi változók vizsgálata a Balaton vízgyűjtőjén. *Hidrológiai Közlöny (Journal of HungarianHydrological Society)* 90: 139−141.

Boda R., Jakab T., Kovács T.Z., **Szivák I.,** Móra A., Sály P., Takács P., Csabai Z., Erős T. & Bíró P.

(2010): A szitakötő együttesek térbeli előfordulási sajátosságainak vizsgálata a Balaton vízgyűjtőjén. *Hidrológiai közlöny (Journal of HungarianHydrological Society)* 90: 11–13.

Deák Cs., **Szivák I.** & Móra A. (2010): Púposszúnyogok (Diptera: Simulidae) térbeli eloszlása és befolyásoló tényezói a Balaton vízgyűjtő területén. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 21: 73–82.

Szivák I. (2009): Diverzitás vizsgálatok az Örvényesi-séd vízi makrogerinctelen fajegyüttesein. *Hidrológiai Közlöny (Journal of HungarianHydrological Society)* 89: 177–179.

Szivák I. & Móra A. (2009): Occurrence of rare caddisfly (Trichoptera) species at the catchment area of Lake Balaton. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 20: 219–230.

Móra A., Kovács T.Z., Boda R., Csabai Z., Deák Cs., Kálmán Z., Soós N. & **Szivák I.** (2009): *A Balaton befolyói makrobentoszának felmérése az EU VKI ajánlásai tükrében 2*. In: Bíró P. & Banczerowski J. (szerk.): A Balaton kutatásának 2008. évi eredményei. MTA, Budapest, pp. 84–92.

Weiperth A., **Szivák I.**, Ferincz Á., Staszny Á., Keresztessy K. & Paulovits G. (2009): A vízszintingadozás hatása a balatoni halász-horgász fogások alakulására. *Állattani közlemények* 94: 199–213.

Horváth G., Majer J., Horváth L., **Szivák I.** & Kriska Gy. (2008): Ventral polarization vision in tabanids: horseflies and deerflies (Diptera: Tabanidae) are attracted to horizontally polarized light. *Naturwissenschaften* 95: 1093–1100. **(IF: 2.126)**

Kriska Gy., Majer J., Horváth L., **Szivák I.** & Horváth G. (2008): A bögölyök polarotaxisa és gyakorlati jelentősége. *Acta Biologica Debrecina-Supplementum Oecologica Hungarica* 18: 101–108.

Kriska Gy., Malik P., **Szivák I.** & Horváth G. (2008): Glass buildings on river banks as "polarized light traps" for mass-swarming polarotactic caddis flies. *Naturwissenschaften* 95: 461–467. **(IF: 2.126)**

Other oral and poster presentation

Szivák I., Móra A., Csabai Z., Takács P., Sály P., Erős T. & Bíró P.: Impact of human activity on macroinvertebrate assemblages in the catchment area of Lake Balaton. *32nd Congress of the International Society of Limnology*, 4-9.08.2013., Budapest, Hungary (poster presentation).

Mauchart P., Czirok A., Horvai V., Ortmann-Ajkai A., **Szivák I.** & Csabai Z.: Niche segregation and biotic interactions between two closely related Gammarids (Crustacea: Amphipoda) – native vs. naturalized invader. *8th Symposium for European Freshwater Sciences,* 1-5.07.2013., Münster, Germany (poster presentation).

Szivák I. & Oláh J.: Ökológiai speciáció és szexuális szelekció szerepe a *Chaetopteryx rugulosa* fajcsoport radiációjában. *X. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 11-13.04.2013., Szalafő, Hungary (oral presentation).

Mauchart P., Czirok A., Horvai V., Ortmann-né Ajkai A., **Szivák I.** & Csabai Z.: Felemáslábú rákok (Crustacea: Amphipoda) mikrohabitat preferenciájának és koegzisztencia viszonyainak vizsgálata a Völgységi-patak hossz-szelvényében. *X. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 11-13.04.2013., Szalafő, Hungary (oral presentation).

Várbíró G., Deák Cs., Bereczki Cs., **Szivák I.**, Csabai Z. & Boda P.: Mintavételi intenzitás hatása a makroszkopikus vízi gerinctelen közösségek funkcionális szerkezetének a becslésére. *X. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 11-13.04.2013., Szalafő, Hungary (oral presentation).

Szivák I.: Klímaváltozás és evolúció forrásokban: őszi tegzesek (Chaetopteryx rugulosa fajcsoport) radiációja, specializációja és hibridizációja a Kárpátokban és a Kárpát-medencében. *Pannon Tudományos Nap,* 18.10.2012, Nagykanizsa , Hungary (oral presentation).

Szivák I., Tóth M., Méhes N. & Móra A.: Makrogerinctelen közösségek visszatelepülése a vörösiszap katasztrófa utáni első évben. *LIV. Hidrobiológus Napok.* 3-5.10.2012., Tihany, Hungary (oral presentation).

Szivák I., Pauls S.U., Kučinić M., Vučković I., Szalontai B., Vadkerti E., Mikes T. & Bálint M.: klímaváltozás és evolúció forrásokban: őszi tegzesek (Chaetopteryx rugulosa fajcsoport) radiációja, specializációja és hibridizációja a Kárpátokban és a Kárpát-medencében. *9. Magyar Ökológus Kongresszus*, 5-7.09.2012., Keszthely, Hungary (poster presentation).

Szivák I., Pauls S.U., Kučinić M., Vučković I., Szalontai B., Vadkerti E., Mikes T. & Bálint M.: Adaptive radiation of *Chaetopteryx rugulosa* group (Trichoptera) induced by climate and geology in the Western Balkans. *International Symposium on „Evolution of Balkan Biodiversity"*, 28-30.07.2012., Zagreb, Croatia (oral presentation).

Szivák I., Tóth M. & Móra A.: A vörösiszap katasztrófa után egy évvel: makrogerinctelen közösségek vizsgálata a Torna-patakon és a Marcalon. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Bereczki Cs., Ortmann-Ajkai A., **Szivák I.** & Csabai Z.: Alkalmas az SDR Simplex módszer mikroélőhelyek együtteseinek vizsgálatára? *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Csabai Z., Boda P., **Szivák I.**, Horváth G. & Bernáth, B.: A holdfázisoktól független hatékonyságú tükröződési-polarizációs rovarcsapdák előnyei a hagyományos fénycsapdákkal szemben a vízi rovarok repülési aktivitásának monitorozásában. *IX. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-14.04.2012., Gyula, Hungary (oral presentation).

Szivák I., Vadkerti E., Szalontai B., Kučinić M., Vučković I., Pauls S.U. & Bálint M.: Klímaváltozás és evolúció forrásokban: őszi tegzesek radiációja, speciációja és hibridizációja a Nyugat-Balkánon. *LIII. Hidrobiológus Napok,* 5-7.10.2011., Tihany, Hungary (oral presentation).

Méhes N., Móra A. & **Szivák I.**: A földrajzi elhelyezkedés és az alapkőzet hatása mecseki kisvízfolyások árvaszúnyog-faunájára. *LIII. Hidrobiológus Napok,* 5-7.10.2011., Tihany, Hungary (poster presentation).

Szivák I., Vadkerti E., Szalontai B., Kučinić M., Vučković I., Pauls S.U. & Bálint M.: Climate change and evolution in springs: radiation, speciation and hybridization of autumn caddisflies on the Western Balkan. *7th Symposium for European Freshwater Sciences*, 27.06. – 01.07.2011., Girona, Spain (oral presentation).

Csabai Z., Boda P., **Szivák I.**, Kálmán Z.: Dispersal activity of aquatic Coleoptera and Heteroptera species: body size and species dependent responses for changing of environmental factors? *7th Symposium for European Freshwater Sciences*, 27.06. – 01.07.2011., Girona, Spain (oral presentation).

Szivák I. & Bálint M.: *Chaetopteryx rugulosa* fajcsoport (Trichoptera: Limnephilidae) taxonómiai revíziója molekuláris biológiai és morfológiai vizsgálatok alapján. *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 14-16.04.2011., Jósvafő, Hungary (oral presentation).

Kálmán A., Boda R., Kálmán Z., Mauchart P., Rozner Gy., **Szivák, I.**, Soós N. & Csabai Z.: Adatok a Zselic vízi makrogerinctelen faunájához. *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (poster presentation).

Lőkkös A., Kondorosy E. Cser B. & **Szivák I.**: A Koppánypatak Somogyacsa és Somogydöröcske közti szakaszának vízi makrogerinctelen faunája. *VIII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia,* 14-16.04.2011., Jósvafő, Hungary (poster presentation).

Csabai Z., Boda P., **Szivák I.** & Kálmán Z.: Diel and seasonal dispersal of aquatic Coleoptera and Heteroptera species – Are the diel dispersal patterns species- or envrionment-dependent? *IX. European Congress of Entomology*, 22-27.08.2010., Budapest, Hungary (oral presentation).

Móra A. & **Szivák I.**: Spatial distribution and diversity of chironomid (Diptera: Chironomidae) assemblages in a small hilly stream. *IX. European Congress of Entomology*, 22-27.08.2010. Budapest, Hungary (poster presentation).

Boda R., **Szivák I.**, Móra A. & Csabai Z.: Feltárható-e kis mintaszám esetén a környezeti tényezők közösségszervező hatása? *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Csabai Z., Boda P., Kálmán Z. & **Szivák I.**: Vízirovarok diszperziójának sajátosságai: érdekességek a napszakos és évszakos mintázatok fajszintű elemzése kapcsán. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (oral presentation).

Deák Cs., **Szivák I.** & Móra A.: Púposszúnyogok (Diptera: Simuliidae) térbeli eloszlása a Balaton vízgyűjtő területén. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (poster presentation).

Soós N., Kálmán Z., Deák Cs., Boda R., **Szivák I.**, Móra A. & Csabai Z.: Adatok a Balaton vízgyűjtője kisvízfolyásainak makrogerinctelen faunájához mennyiségi mintavételek alapján. *VII. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 15-17.04.2010., Sümeg, Hungary (poster presentation).

Szivák I., Móra A., Deák Cs., Kálmán Z., Soós N., Boda R., Kovács T.Z., Sály P., Takács P., Csabai Z., Erős T. & Bíró P.: Makroszkopikus vízi gerinctelen szervezetek térbeli előfordulási sajátosságait befolyásoló közvetlen élőhelyi változók vizsgálata a Balaton vízgyűjtőjén. *LI. Hidrobiológus napok*, 30.09 – 02.10.2009., Tihany, Hungary (poster presentation).

Móra A., **Szivák I.**, Boda R. & Török J.K.: Árvaszúnyog-együttesek tér-és időbeli változásai egy dombvidéki kisvízfolyásban. *LI. Hidrobiológus napok*, 30.09 – 02.10.2009., Tihany, Hungary (oral presentation).

Boda R., Jakab T., Kovács T.Z. **Szivák I.,** Móra A., Sály P., Takács P., Csabai Z., Erős T. & Bíró P.: A szitakötő együttesek térbeli előfordulási sajátosságainak vizsgálata a Balaton vízgyűjtőjén. *LI. Hidrobiológus napok*, 30.09– 02.10.2009., Tihany, Hungary (poster presentation).

Szivák I., Móra A. & Török J.K.: Spatio-temporal variations of caddisfly assemblages in a chalk stream, Balaton Upland, Hungary. *13th International Symposium on Trichoptera*, 22-27.06.2009., Biazlowieza, Poland (poster presentation).

Móra A., **Szivák I.**, Deák Cs., Boda R., Csabai Z., Sály P., Takács P., Erős T. & Bíró P.: Environmental factors influencing the distribution of EPT assemblages in streams of Lake Balaton's catchment area, Hungary. *13th International Symposium on Trichoptera*, 22-27.06.2009., Biazlowieza, Poland (poster presentation).

Szivák I. & Móra A.: Tegzesegyüttesek tér- és időbeli változásai egy patak hossztengely mentén. *VI. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 16-18.04.2009., Villány, Hungary (oral presentation).

Szivák I. & Móra A.: Ritka tegzes fajok előfordulása a Balaton vízgyűjtőjén (Trichoptera). *VI. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 16-18.04.2009., Villány, Hungary (poster presentation).

Boda R., **Szivák I.**, Móra A., Deák Cs., Sály P., Takács P. & Erős T.: Vízi makrogerinctelen szervezetek térbeli előfordulási sajátosságainak elemzése a Balaton vízgyűjtőjén. *VI. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 16-18.04.2009., Villány, Hungary (oral presentation).

Kovács T.Z., Deák Cs., **Szivák I.** & Móra A.: Kisvízfolyások jellemzése a makrogerinctelenek szaprobitási, táplálkozásbiológiai és longitudinális elterjedési csoportjai alapján. *VI. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 16-18.04.2009., Villány, Hungary (oral presentation).

Szivák I.: Diverzitás vizsgálatok az Örvényesi-séd vízi makrogerinctelen fajegyüttesein. *L. Hidrobiológus Napok*, 01-03.10.2008., Tihany, Hungary (poster presentation).

Szivák I.: Faunisztikai felmérés és tér-időbeli mintázat elemzés az Örvényesi-séd vízi makrogerinctelen fajegyüttesein. *V. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 10-12.04.2008., Nyíregyháza, Hungary (oral presentation).

Kriska Gy., Majer J., Horváth L., **Szivák I.** & Horváth, G.: A bögölyök polarotaxisa és gyakorlati jelentősége. *V. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 10-12.04.2008., Nyíregyháza, Hungary (oral presentation).

Horváth G., Malik P., Hegedüs R**., Szivák I.** & Kriska Gy.: Miért vonzódnak a tegzesek a függőleges üvegfelületekhez, miért szállnak rájuk, s miért maradnak ott? *V. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 10-12.04.2008., Nyíregyháza, Hungary (oral presentation).

Szivák I.: Polarotaxis kísérleti bizonyítása bögölyöknél: a polarozációlátás lehetséges szerepe a bögölyök szaporodási és táplálkozási viselkedésében. *XI. Országos Felsőoktatási Környezettudományi Diákkonferencia*, 25-26.03.2008, Nyíregyháza, Hungary (oral presentation).

Szivák I.: Az Örvényesi-séd makrozoobentosz faunájának felmérése és téridő mintázatának vizsgálata. *XLIX. Hidrobiológus napok*, 03–05.10.2007., Tihany, Hungary (poster presentation).

Szivák I.: Az Örvényesi-séd makrozoobentosz faunájának felmérése és téridő mintázatának vizsgálata - Első eredmények. *IV. Makroszkopikus Vízi Gerinctelenek Kutatási Konferencia*, 12-13.04.2007., Tihany, Hungary (poster presentation).

Cumulative impact factor (2012): 9.542

Total citation: 54

Cited by others: 22

H-index: 3