University of Sopron
Faculty of Forestry

Thesis of PhD dissertation

The examination of ground-dwelling spider assemblages in gap felling forest-subcompartments

László Bali

Sopron
2022

Doctoral school: Roth Gyula Doctoral School of Forestry and Wildlife Management Sciences

Head of school: Prof. Dr. Sándor Faragó

Program: Ecology and Diversity of Forest Ecosystems

Program Leader: Prof. Dr. Csaba Mátyás

PhD Supervisors: Dr. habil Katalin Tuba
Dr. habil Csaba Sinetár

Introduction

One of the largest renewable natural resources in our country is provided by our forest areas. They must be cultivated in accordance with the approach of farming methods that ensure continuous forest cover. Among its main guiding principles, the most important is to follow and simulate the processes taking place in natural forests. In forestry practice, these requirements are best met by the perennial forest regime. One of the most promising conversion mode used to switch from pruning to perennial forest mode, is the gap felling renewal.

Studies of naturally occurring gaps show that abiotic environmental factors in them may differ significantly from those in the surrounding forest stand. The formation of gaps also has a serious impact on the arthropod fauna of the area, as it is accompanied not only by the abiotic changes already mentioned, but also by the transformation of the undergrowth. As the method can be considered a relatively new forest management type in Hungary, we have only a small amount of information about its effects on the ground-dwellin arthropod fauna, including spiders.

Spiders play a significant role in most terrestrial ecosystems. Although they were the subject of a relatively large number of studies on agro-ecosystems in Hungary, they can be considered as a poorly researched group in terms of forestry, although many international studies have shown them to be suitable subjects for studying the effects of changes in forest ecosystems. This is because most spider species have specific and well-defined habitat needs, and changes in various environmental factors easily and quickly affect their abundance, so they are also sensitive to changes in forest structure and microclimate. Therefore, they can be considered an excellent indicator organisms. Their role, in addition to their ecological definability, is further supported by the fact that their taxonomy is well explored and they can be collected relatively cost-effectively and reproducibly. Based on all this, their communities are suitable to study the changes in biodiversity induced by the formation of artificial gaps.

Aims

The main goals of my research were to better understand the spider fauna of the experimental areas and to explore the different effects of artificial opening on them:

1. The spider fauna of my sample areas has not been studied yet, so my aim was to survey the ground-dwelling spider fauna of the forests using a standardized method. I hypothesized that my research could yield new faunistic results for the areas and possibly the region as well.
   a. What are the most common species of the areas?
   b. Are there any protected species in the areas?
   c. Are there any species not previously described in Hungary in the areas?
   d. How does the seasonal activity of common species change compared to the literature data?
   e. Was my sample collection long enough for such studies?
2. I hypothesized that the composition of the spider assemblages in the Bejcgyertyános 13/A and Vép 32/D forest-subcompartments may have been different.
   a. How similar are the species and individual numbers and diversity of the two faunas?
   b. How similar are the seasonal and spatial activities of the two faunas?
   c. How similar are the composition and ecological characteristics of the two faunas?
3. I hypothesized that the artificial gap openings had observable effects on the structure of ground-dwelling spider assemblages and that one of these effects was the formation of edge zones between forest stands and the 15 x 30 m gaps formed in them.
   a. Examined along the transects laid along the longitudinal axis of the gaps, do the species and specimen numbers, the diversity indices, the frequency of the indicator species, and the guild structure of the spider assemblages show significant changes?
   b. How much do the data from the control study differ from the results of the gap-related studies?
   c. Are the traps in the gaps, in the gap edges and in the gaps separated from eachother from a community ecological point of view?

4. As the vegetation structure of a temperate forest undergoes significant changes over the course of a year, I hypothesized that the effects of artificial gap opening will not occur to the same extent over the course of a year.
5. I hypothesized that the biotic and abiotic factors (undergrowth cover, soil moisture, canopy openness, illumination) examined by ERTI, as well as the lying deadwood in the areas, affect the composition of the surveyed spider assemblages.
   a. What are the relationships between these factors and the occurrence of the most common species?
   b. What are the relationships between these factors and the frequency of each guild?
   c. What are the links between these factors and each of the community indicators?
6. Since the artificial gap opening can be considered as a close-to-nature and sustainable silvicultural intervention, I assumed that from an ecological point of view there are no harmful consequences for the ground-dwelling spider assemblages.
   a. How do the relevant indicators compare between the data of the gaps and forest stands?
   b. How do the relevant indicators compare between the data of the gap felled stands and the control area?
   c. How do the relevant indicators compare between the data of the experimental forest areas with gaps and other, differently cultivated forest areas?
7. I hypothesized that the results of pitfall trap data collection and vacuum (D-Vac) sample collection show different elements of ground-dwelling spider assemblages more efficiently, so the data obtained by the two methods differ.
   a. Is the composition of the two assemblages the same?
   b. Do pitfall trapping and D-Vac sample collection similarly demonstrate the potential effects of artificial gap openings on ground-dwelling spider assemblages?

Materials and methods

In my dissertation, I present the results of a two-year data collection study, which fits into an experimental system analyzing the effects of artificial gap opening started by ERTI in 2010. In doing so, I surveyed and compared the ground-dwelling spider faunas of two forest sub-comartments (Bejcgyertyános 13/A, sessile oak - hornbeam forest; valamint Vép 32/D, turkey oak forest) and investigated the effects of artificial gap openings on their assemblages. Within the framework of these studies, I analyzed the changes in their community structure, both in space (especially with regard to the formation of possible edge zones) and in time. In addition to the ecological aspects of gap openings, I also studied the effects of biotic and abiotic factors influenced by them, as well as the effects of lying dead wood on spider assemblages. My sample collection took place in and around 2-2 (approximately 15 x 30 m) gaps formed in the two forest-subcompartments, for which I used Barber-type double cupped pitfall traps with roof. These were replaced fortnightly, both in 2013 and 2014, from April to November.

In addition to this study, I also performed three more sample collections in the Vép survey area. The purpose of a winter trapping (2015) was to investigate the possible effects of gap opening under a leafless stand. The aim of a D-Vac sampling (summer 2015) was to compare the results of pitfall trapping with an alternative sampling method. And finally, the purpose of a control sampling (summer 2016) was to compare the results with data from non-affected forest patches.

In addition to all this, I also carried out additional pitfall trap surveys in forest-subcompartments of different nature and cultivation (Educational Forest in Ásotthalom, Nyíri Forest in Kecskemét, Roth's single selection forest in Sopron, Cold Water Valley Forest Reserve in Sopron, Szalafő Forest Reserve).

Results and their discussion

During the two-year pitfall trapping study, which constitutes the main part of my dissertation, I processed a total of 30,386 spider specimens, based on which I detected a total of 168 species in the two sample areas. Among them was a protected species, *Atypus piceus* in both forest-subcompartments, and thus I have shown two new regional occurrences of the species. I also discovered a new occurrence of another spider species in the Hungarian fauna: *Centromerus leruthi* (in Bejc).

In both cases, the spider activity in 2013 was higher, however, there was no significant difference between the data for 2013 and 2014 or the data for the transect pairs. Based on their species saturation curves, I consider the spider fauna of both sample areas to be well explored. There was also no significant difference between the assemblages of the two stands according to their species composition compared on the basis of their specimen numbers. Both the species- and the specimen numbers were higher in Bejcgyertyános. The values of diversity, on the other hand, proved to be higher in Vép, and this was also the case regarding equitability. There was no significant difference in the composition of the two fauna, neither in terms of the geographical distribution of the species nor in terms of the families, although the proportion of wolf spiders in the Bejc sample was more than one and a half times higher. The average body size of the spiders was larger in Vép, but no significant difference was detected between the two samples either. *Pardosa alacris* proved to be the most common species, and the variance of the assemblages was mainly determined by the occurrence of this spider. The frequency of ground hunting spiders was higher in both sample areas. This is also true for species of close-to-natural, partially shaded and arid habitats. However, based on the type of the habitat, the forest habitat species were the most common in Bejc and the edge species were most common in Vép.

The seasonal activity of the species with the highest dominance (if they occurred in both forest areas) was similar in the two sample areas. In most cases, these results were in line with the literature data. The species *Pardosa alacris, Zodarion germanicum, Euryopis flavomaculata, Urocoras longispina* and *Atypus piceus* showed some differences. Thus, the results of my studies contributed new data to characterize the seasonal activity of these spiders. In terms of spatial activity, the following common species showed greater differences between the two sample areas: *Drassyllus villicus*, *Trochosa terricola*, *Zodarion germanicum*, *Euryopis flavomaculata*, *Zora nemoralis,* and *Xysticus luctator*. The reason for this varied from species to species, but based on individual analyzes, it is mostly due to the different amount of dead wood, sapling cover and humidity of the two leaks.

The effects of the artificial gap opening on the ground-dwelling spider assemblages were analyzed on the basis of the sampled data along the trap line laid along the longitudinal axis of the gaps as a gradient. According to such analyzes, both the species- and specimen numbers showed an increasing trend towards the middle of the trap series, i.e. inside the gaps, which is also true for the values of the diversity indices calculated on the basis of species composition. Correlation analysis (Pearson r) showed this trend to be significant for species numbers in Bejc and for species and specimen numbers, as well as Shannon diversity indices in Vép. It was generally true for each of the diversity indices that their locally lowest values were recorded for traps 5 and 9, with a steady increase between them.

Based on community structure data, the following groups showed a significantly higher frequency within the gaps: sheet weavers (Bejc and Vép), funnel spiders (Vép), orb weavers (Bejc and Vép), forest habitat species (Bejc and Vép), semi-arid species (Bejc and Vép), species of humid habitats (Bejc and Vép).

According to the development of the Renkonen and Jaccard similarity indices, the similarity of the traps of the gaps to their neighbors was lower and that of the traps of the gaps was higher. A similar result was obtained from the N-MDS ordination study based on cluster analysis and the Bray-Curtis similarity index. Based on these, the traps of the transects were grouped into two large groups. The smaller ones got the gap traps, the bigger ones the stand traps. And the traps placed on the edges of the gaps fall into one of these two groups.

The formation of a well definied edge zone was not confirmed by any of the studies. Instead, the entire interior of the gaps acted as an edge zone. In addition to the results described above, this was supported by the significantly higher gap activity of the typically edge specialist *Aulonia albimana*.

As part of the analysis of the effects of artificial gap openings, the soil moisture, weed cover, canopy openness and illumination data measured by the network set up by the ERTI Sárvár Experimental Station, as well as the lying dead wood surveyed by me all showed several relationships between the round-dwelling spider assemblages.

In terms of hunting strategies, the frequency of other hunter, tangle-web weavers and special net species showed a positive relationship with the distance from the center of the gaps and the amount of deadwood. Furthermore, there was a negative relationship with enlightenment. Ambush species showed a positive relationship with the distance from the center of the gaps, the number and degree of decay of the deadwood, and a weaker one with its amount. In addition, they were negatively related to soil moisture and canopy openness. Ground hunting species showed a positive relationship with illumination, while distance from the center of the gapss and soil moisture showed a negative relationship. Sheet web spiders showed a positive relationship with soil moisture, canopy openness, and undergrowth cover.

Positive significant (Pearson r) correlations were shown between undergrowth cover and specimen numbers, species numbers, and Shannon diversity values; and between openness, illumination and species number; and between soil moisture and equitability. There is a negative significant correlation between light conditions and Simpson diversity and equitability.

The effect of artificial gap opening on ground-dwelling spider assemblages is not constant during the year, it ismost noticeable in summer and the least in winter. This was particularly the case for sheet weavers and, to a lesser extent, ground hunting and funnel spiders, as well as to a lesser extent for the specimen numbers and diversity of the entire assemblage. However, there was no significant difference between the spider assemblages based on either the sampling years or the orientation of the gaps.

I also compared the results of pitfall trapping, which is dependent on the locomotor activity of spiders and thus considered a relative sampling method, with the results of the vacuum (D-Vac) sampling method, which is considered to be the absolute sampling method. During the study, I collected an additional 1254 (1087 juveniles) from 41 species. N-MDS ordination analysis based on the Bray-Curtis similarity index showed that soil trapping and vacuum samples were well separated. Based on the diversity profiles, the vacuum collected sample also appeared to be of higher diversity, but based on the results of the T-test, there was no significant difference between the species assemblages of the two samples. Based on the Renkonen similarity indices, the D-Vac samples were most similar to the pitfall trap samples in the middle of the gaps. The effects of gap opening were also demonstrated by vacuum sample collection. The major differences between the ground-dwelling spider assemblages revealed by the two methods were that pitfall trapping was more effective in detecting rarer and/or larger species as well as nocturnaly active spiders; while D-vac collection was more sensitive to smaller, more stationary and locally common species.

In 2016, I also performed a control-type soil trapping. During the study, I captured an additional 3,457 individuals of 57 species. The results of the control study showed that most of the effects previously described and attributed to artificial gap opening did not occur in the control trap set. In addition, the artificial gap openings studied by me had habitat-creating and diversity-increasing effects. However, based on the analyzes, the nature of the forest patch affected by the gaps did not differ significantly from its control.

Finally, I also compared the ground-dwelling spider assemblages trapped in the Bejcgyertyános 13/A and Vép 32/D forest-subcompartments with the data of five other forests with different management types and naturalness. According to the results of this study, the ground-dwelling spider assemblages of the forest areas affected by the gap felling showed greater similarity to the forest assemblages of the Ásotthalom (clear cutting), the Roth (single selection) and the Szalafő (reserve) forests. A common feature of these forests is that there are open habitats within their stands. Furthermore, the diversity of the spider fauna of the forest areas containing gaps was comparable to the others, and in several cases it was higher. Also, based on the habitat preference of the indicator species, their naturalness can be considered good. During these sample collections I discovered new regional occurrences of tof four protected species in. I also discovered four new nation-wide occurrences of additional four species.

Theses

1. During the sample years of 2013-14, I collected a total of 35,214 spiders in the sample areas of Bejcyertyános 13/A and VÉP 32/D, representing 173 species of spiders from 27 families.
   a. The most common species in each sample area are listed in Tables 3 and 5 of my dissertation.
   b. Taking into account the additional data collections too, I detected new regional occurrences of 4 protected spider species: *Atypus affinis* (Szalafő), *Atypus piceus* (Bejcgyertyános, Szalafő, Vép), *Eresus kollari* (Ásotthalom) and *Nemesia pannonica* (Ásotthalom).
   c. Taking into account the further data collection too, I detected new nation-wide occurrences of 4 spider species in Hungary: *Centromerus leruthi* (Bejcgyertyános), *Cybaeus tetricus* (Sopron), *Gnaphosa montana* (Sopron) and *Tapinocyba pallens* (Sopron).
   d. I contributed new data to the seasonal activity of the following species: *Pardosa alacris*, *Urocoras longispina*.
   e. Based on the species saturation curves, I consider the ground-dwelling spider assemblages of the two forest parts to be well explored, no significant increase in the number of species would have been expected by continuing the sample collection.
2. There was no significant difference between the ground-dwelling spider assemblages of the Bejcgyertyános 13/A and Vép 32/D forest-subcompartments. The number of species occurring in both forest stands was 77, accounting for 44.5% of the total species composition, with specimens of these species accounting for 97.6% of the total trapped fauna. The most common spider in both places was *Pardosa alacris*, and the variance of the assemblages was mainly determined by the occurrence of this species.
   a. Most spider species showed their main activity in the early summer period (end of April to June), when the species- and specimen numbers proved to be the highest. Due to the increased locomotor activity of mature animals, the applied pitfall trapping sampling is the most effective at that period.
   b. The composition of the spider fauna did not show any appreciable difference from a geographic point of view. The distribution of the more common families were also similar in

the two forest-subcompartments. In both assemblages, hunting spiders dominated uniquely, with ground hunters being the most common. Based on the habitat preferences of the indicator species, both stands can be considered as natural, partially shaded and moderately dry forest. Based on habitat selection, forest habitats were more common in Bejcgyertyános and edge habitats in Vép.

   c. The species- and specimen numbers were higher in Bejcgyertyános 13/A, while species diversity (Shannon and Simpson) and equitability were higher in the fauna of the Vép 32/D forest-subcompartment.

3. Based on the results of my studies, the artificial flap opening had a clear effect on the structure of the ground-dwelling spider assemblages. However, a well-defined edge zone between the artificial gaps and the forest stands could not be detected based on the data of the trap system I used. The entire area of the gaps was edge-like. This was demonstrated by the frequency of *Aulonia albimana*, some sheet weaver spiders (*Lynyphiidae*), and species of semi-arid and humid habitats.
   a. Both species- and specimen numbers, as well as diversity values, were higher for gap traps.
   b. Based on a control study, artificial gap opening clearly had an effect on the characteristics of the ground-dwelling spider assemblages.
   c. The separation of the gap- and the forest stand traps was verified by multivariate analyzes.

4. The effects of artificial gap opening on ground-dwelling spider assemblages are most pronounced between April and July, and its occurred the least in the winter. However, there was no significant difference between the different annual data of the spider assemblages.

5. The biotic and abiotic factors influenced by the artificial gap opening could also be registered at the level of specific species populations.
   a. Among the most common species positive significant relationships were shown by: *Trochosa terricola, Urocoras longispina*, *Xysticus luctator*, *Scotina celans* and between the distance from the center of the gaps; between *Pelecopsis*

*radicicol*a and soil moisture; between *Trochosa terricola* and undergrowth cover; between *Aulonia albimana*, *Zelotes apricorum* and canopy openness; *Drassyllus villicus*, *Zelotes apricorum* and between the degree of illumination; between *Atypus piceus*, *Zelotes apricorum*, *Xysticus luctator* and between the amount of dead wood.

   b. The frequency of other hunter, tangle-web spiders and special net species showed a positive relationship with the distance from the center of the gaps and the amount of deadwood, as well as a negative relationship with illumination. Ambush hunter species showed a positive relationship with distance from the center of the gaps, number of dead wood, and degree of rot; in addition they were negatively related to soil moisture and canopy openness. Ground hunter species showed a positive relationship with illumination, while distance from the center of the gaps and soil moisture showed a negative relationship. Sheet web spiders showed a positive relationship with soil moisture, canopy openness, and undergrowth cover.
   c. There were positive significant correlations between undergrowth cover and the species- and specimen numbers, as well as Shannon diversity; in addition, between openness, illumination, and species number. I found a negative significant relationship between distance from the center of the gaps and species- and specimen numbers, and Simpson diversity; and between soil moisture and illumination and Simpson diversity.

6. The artificial gap opening had no negative consequences for ground-dwelling spider assemblages. Its effects on the species richness and diversity of the near-ground spider fauna can be considered positive, which was also confirmed by a control study.
   a. The occurrence of higher values of the above-mentioned indicators in the gaps was also confirmed by a correlation study.
   b. These indicators were also found to be higher than those observed in the control trapped stands.
   c. Neither the number of specimens nor the diversity of the ground-dwelling spider assemblages of the Bejcgyertyános 13/A and Vép 32/D forest-subcompartments affected by artificial gap openings lagged behind, and in some cases

exceeded those of different naturalities and similar sizes but without artificial gap openings. Based on the species composition of ground-dwelling spider assemblages, they were most similar to forests with open habitats, so the artificial gap opening modeles the processes typical of naturally opening forests.

7. There was no significant difference between the assemblages collected by the vacuum (D-Vac) and pitfall trapping methods, based on their species compositions. However, both the species- and specimen numbers per trapping unit the sample collected by the vacuum method proved to be richer in terms of Shannon diversity.
   a. Due to the principles of the two collection methods, differences can be found in hunting strategies, mean body size, circadian activity, and similarity analyzes.
   b. Vacuum sample collection, like pitfall trapping, proved to be suitable for exploring the effects of gap openings on ground-dwelling spider assemblages. This was most evident in the species- and specimen numbers as well as the Shannon diversity indices. Based on the similarity studies of the samples obtained by vacuum collecting and conventional pitfall trapping, the greatest similarity was found in the case of traps inside the gaps.

Relevant publications

MTMT: https://m2.mtmt.hu/gui2/?type=authors&mode=browse&sel=10047749

Scientific essays

Bali L. (2014): Talajközelben élő pókok összehasonlító vizsgálata átalakító üzemmódú erdők lékeiben. Diplomamunka. 108 p. Nyugat-magyarországi Egyetem, Sopron, 2014.

Book chapters

Bali L. (2021): A Tanulmányi erdő pókjai. In: Andrési P. (szerk.) Az ásotthalmi Tanulmányi erdő állatvilága Ásotthalom, Magyarország: Ásotthalmi Bedő Albert Alapítvány. pp. 215-232.

Bali L., Andrési D., Szinetár Cs. & Tuba K. (2017): Léknyitás hatása talajközelben élő pókközösségre. In: Szabó P. (szerk.) Kutatás-fejlesztés-innováció az agrárium szolgálatában. Budapest, Magyarország : Mezőgazda Kiadó. pp. 119-128.

Peer reviewed international scientific journal articles

Bali L., Andrési D., Tuba K., & Szinetár Cs. (2019): Comparing pitfall trapping and suction sampling data collection for ground-dwelling spiders in artificial forest gaps. *Arachnologische Mitteilungen* 58: 23-28. DOI: 10.30963/aramit5808

Andrési D., **Bali L.**, Tuba K. & Szinetár Cs. (2018): Comparative study of ground beetle and ground-dwelling spider assemblages of artificial gap openings. *Community Ecology* 19(2): 133-140.

Peer reviewed Hungarian scientific journal articles

Bali L., Andrési D., Szinetár Cs. & Tuba K. (2022): Betekintés a kecskeméti Nyíri-erdő talajközeli pókfaunájába. *Erdészettudományi Közlemények* 11(2): 115-129.

Bali L., Tuba K., & Szinetár Cs. (2020): A Roth-féle szálaló erdő arachnológiai vizsgálata. *Erdészettudományi Közlemények* 10(1-2): 107-122.

Bali L., Andrési D., Szinetár Cs. & Tuba K. (2020): Betekintés a bejcgyertyánosi Farkas-erdő talajközeli pókfaunájába. *Savaria Természettudományi és Sporttudományi Közlemények* 18: 59-74.

Bali L., Andrési D., Ferka R., Szinetár Cs. & Tuba K. (2020): Talajcsapdás arachnológiai vizsgálat a Szalafő Erdőrezervátum területén. *Erdészettudományi Közlemények* 9(2): 99-112.

Bali L., Kiss K. I. & Tuba K. (2019): A Hidegvíz-völgy Erdőrezervátum talajfelszín közeli pók-együtteseinek jellemzése. *Növényvédelem* 80[N.S. 55] 9: 385-391.

Bali L., Szinetár Cs., Andrési D., Tuba K. & Kálmán K. (2017): Talajcsapdás arachnológiai vizsgálat az Ásotthalmi Tanulmányi-Erdőben. *Erdészettudományi Közlemények* 7: 69-84.

Bali L., Szinetár Cs., Andrési D., Kámpel J. & Tuba K. (2016): Mesterségesen kialakított lékek talajközelben élő pókfaunájának (Araneae) vizsgálata. *Növényvédelem* 52(6): 287-297.

Articles published in professional journals

Bali L., Andrési D., Tuba K., & Szinetár Cs. (2020): A dél-alföldi erdők arachnológiai kutatásaink áttekintése. *Erdészeti Lapok* 155(11): 343.

Bali L., Kiss K. I. & Tuba K. (2019): Betekintés a Hidegvíz-völgy Erdőrezervátum pókfaunájába. *Erdészeti Lapok* 154(10): 323-324.

Conference proceedings and other abstracts

Szinetár Cs., Kovács P., **Bali L.**, Kiss K. & Takács G. (2020): Ez már valóban az Alpok? A Soproni-hegység arachnológiai kutatása (2017-2019). In: Puskás J. (szerk.) XV. Regionális Természettudományi Konferencia 2020. január 30. – Program és az előadások összefoglalói. p. 10. Szombathely.

Bali L., Andrési D., Tuba K., & Szinetár Cs. (2019): A dél-alföldi erdők arachnológiai kutatásaink áttekintése. In: Csiha I. (szerk.) Alföldi Erdőkért Egyesület Kutatói Nap 2019.: Tudományos Eredmények a Gyakorlatban – Konferenciakötet pp. 172-175. Alföldi Erdőkért Egyesület. Kecskemét, 2019.11.12.

Bali L., Szinetár Cs., Andrési D. & Tuba K. (2019): Talajfelszín közeli pók- és futóbogár közösségek összehasonlítása mesterséges

léknyitás függvényében. XIX. Magyar Pókász Találkozó. p. 20. Balatongyörök, 2019.10.4-6.

Bali L., Andrési D., Szinetár Cs. & Tuba K. (2019): Two-year survey of ground-dwelling spider assemblages of artificial forest gaps. 2nd International Conference on Community Ecology. pp. 84-85. Akadémiai Kiadó, Budapest. Bologna, 2019.06.04-06.

Bali L., Tuba K., Andrési D. & Szinetár Cs. (2018): Comparing pitfall trapping and suction sampling data collecting for ground-dwelling spiders in relation of artificial gaps. In: Mezőfi, L; Szita, É (szerk.) 31st European Congress of Arachnology : Final Program & Abstracts. Budapest, Magyarország (2018) p. 35.

Bali L., Tuba K., Andrési D. & Szinetár Cs. (2018): Betekintés a Kecskemét környéki erdők talajközeli pókfaunájába. In: Csiha I. (szerk.) Alföldi Erdőkért Egyesület Kutatói Nap 2018.: Tudományos Eredmények a Gyakorlatban – Konferenciakötet pp. 110-111. Alföldi Erdőkért Egyesület. Kecskemét, 2018.11.13.

Bali L., Andrési D., Tuba K. & Szinetár Cs. (2017): Szezonális változások egy nyugat-magyarországi cseres talajközeli pókfaunájában. Előadás, anyaga lektorált absztraktkötetben megjelent. In: Bidló A. & Facskó F. (szerk.) (2017): Soproni Egyetem Erdőmérnöki Kar VI. Kari Tudományos Konferencia. Soproni Egyetem Kiadó Sopron. pp. 85-90.

Bali L., Andrési D., Szinetár Cs. & Tuba K. (2017): Comparative study of ground beetle and ground-dwelling spider assemblages. 1st International Conference on Community Ecology. pp. 100-105. Akadémiai Kiadó, Budapest, 2017.09.28-29.

Bali L., Szinetár Cs., Andrési D., Tuba K. & Kálmán K. (2017): Az Ásotthalmi Tanulmányi-erdő talajfelszíni pók és futóbogár közösségeinek összehasonlítása. In: Csiha I. (szerk.) Alföldi Erdőkért Egyesület Kutatói Nap 2017.: Tudományos Eredmények a Gyakorlatban – Konferenciakötet pp. 126-135. Alföldi Erdőkért Egyesület. Kecskemét, 2017.10.02.

Bali L., Szinetár Cs., Andrési D. & Tuba K. (2017): Talajközeli pók- és futóbogár közösségek összehasonlító vizsgálata egy nyugat-magyarországi cseresben. XVIII. Magyar Pókász Találkozó. Fertőújlak, 2017.09.22-24.

Bali L., Szinetár Cs., Tuba K., Ferka R. & Andrési D. (2017): Talajcsapdás arachnológiai vizsgálat a Szalafő Erdőrezervátum területén. In: Puskás J. (szerk.) XII. Regionális Természettudományi Konferencia – Konferenciakötet. p. 8. Nyugat-magyarországi Egyetem. Szombathely, 2017.01.25.

Bali L., Szinetár Cs., Andrési D., Tuba K. & Kálmán K. (2016): Ritka és védett pókfajok előfordulása az Ásotthalmi Tanulmányi Erdő területén. In: Lipák L. (szerk.) Alföldi Erdőkért Egyesület Kutatói Nap XXVI.: Tudományos Eredmények a Gyakorlatban – Konferenciakötet pp. 43-48. Alföldi Erdőkért Egyesület. Kecskemét, 2016.11.03.

Bali L., Szinetár Cs., Tuba K., Ferka R. & Andrési D. (2016): New occurrences of *Atypus* spider species. In: Ács K., Bencze N., Bódog F., Haffner T., Hegyi D., Horváth O. M., Hüber G. M., Kis Kelemen B., Lajkó A., Mátyás M., Szendi A., Szilágyi T. G (szerk.) V. Interdiszciplináris Doktorandusz Konferencia Konferenciakötet: 5th Interdisciplinary Doctoral Conference Conference Book. pp. 39-47. Pécsi Tudományegyetem Doktorandusz Önkormányzat. Pécs, 2016.05.29.

Bali L., Szinetár Cs., Andrési D. & Tuba K. (2016): Két év talajcsapdás mintagyűjtéseinek tapasztalatai egy nyugat-dunántúli erdő lékjeiben. XVII. Magyar Pókász Találkozó 2016 Velencei-tó: Programok és összefoglalók. p. 5. Gárdony, 2016.09.16-18.

Bali L., Andrési D. & Szinetár Cs. (2015): Folyamatos erdőborítást célzó kísérleti erdőterület lékjeinek pókfaunisztikai vizsgálata. In: Puskás J. (szerk.) X. Regionális Természettudományi Konferencia – Konferenciakötet. p. 1. Nyugat-magyarországi Egyetem. Szombathely, 2015.01.28.

Andrési D., **Bali L.** & Lakatos F. (2014): Talajcsapda vizsgálatok mesterségesen kialakított lékekben. In: Bidló A., Horváth A. & Szűcs P. (szerk.) IV Kari Tudományos Konferencia: Konferenciakiadvány. pp. 312-315. Nyugat-magyarországi Egyetem. Sopron, 2013.12.10.

Oral presentations

Bali L.: Talajcsapdás arachnológiai vizsgálatok, valamint pókok és tartásuk. Soproni Egyetem, Herman Ottó Szakkollégium. Sopron, 2017.04.27.

Bali L. (2015): Arachnológiai betekintés. Mobilis Kísérletbazár. Széchenyi István Egyetem. Győr, 2015.04.17.

Horváth B., Andrési D., **Bali L.**, Tuba K., Tóth V. & Lakatos F. (2013): Az erdőszerkezet és az erdei növényzet hatása a rovarközösségekre. Silva Naturalis – A folyamatos erdőborítás megvalósításának ökológiai, konzervációbiológiai, közjóléti és természetvédelmi szempontú vizsgálata. A magyar tudomány ünnepe „A természeti környezet ökológiai szolgáltatásai”. Sopron, 2013.11.05.

Posters

Bali L., Szinetár Cs., Andrési D. & Tuba K. (2017): A Szalafő Erdőrezervátum (ER-35) különböző fás élőhelyeinek arachnológiai vizsgálata. Life in Forests – Élő Erdő Konferencia az erdőgazdálkodásról és erdőkezelésről Natura 2000 területeken. Soproni Egyetem. Sopron, 2017.03.21-22.

Notes