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Original paper

Príspevok k poznatkom o výskyte denných motýľov (Lepidoptera: Papilionoidea) okolia obcí východného Slovenska, časť 9 – Šandal, Kručov, Vyšná Olšava, Ondavka, Veľkrop a Potôčky (Ondavská vrchovina)

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Abstract. Contribution to the knowledge of the butterflies (Lepidoptera: Papilionoidea) distribution in surrounding of villages from eastern Slovakia, part 9 – Šandal, Kručov, Vyšná Olšava, Ondavka, Veľkrop a Potôčky (Ondavská vrchovina Mts.)
The author investigated butterflies of superfamily Papilionoidea in the surrounding of six villages Šandal, Kručov, Vyšná Olšava, Ondavka, Veľkrop a Potôčky during years 2019 – 2023. This study builds on the results obtained in the study area of eastern Slovakia and complement faunistic data which may be the basis for further ecological evaluation. Totally were identified 68 species and 3 765 individuals belonging to 5 families. Among species were also recorded six vulnerable species (*Lycaena dispar* Haw., *Pseudophilotes vicrama* Moore, *Phengaris arion* L., *Brenthis ino* Rott., *Melitaea diamina* Lang, *M. phoebe* Den. et Schiff.), one endangered species (*Carcharodus floccifera* Zell.) and two species with near threatened conservation status (*Iphiclides podalirius* L., and *Fabriciana laodice* Pall.). According to the habitat preferences of butterflies were recorded ubiqvistic, mesophilic, xerothermophilic and hygrophilous species. Similarly, studied sites represents a set of several microhabitats, which creates favourable conditions for the survival of several species. The obtained data helps to spread knowledge of butterflies in the territory of eastern Slovakia (Ondavská vrchovina Mts.). Most of the species were sedentary in terms of mobility, which is significant in relation to the presence of some species attached to food plants or specific habitat conditions (e.g., *Satyrium pruni* L., *Cupido decolorata* Staud., *Coenonympha glycerion* Brkh., *B. ino*, and *M. diamina*). Eight different types of butterflies were confirmed according to their faunistic type of distribution, of which palearctic, west-palearctic and eurosiberian species were the most dominant. The occurrence of these species is consistent with the localisation of the area within Europe. The occurrence of more thermophilic species of butterflies belonging to the ponto-mediterranean and mediterranean faunistic elements also points to the thermophilic nature of the lepidopterofauna of eastern Slovakia.

Key words: butterflies, cultural landscape, biodiversity

Úvod

Faunistické výskumy sú napriek ich veľmi aktuálnej potrebe pre poznanie biodiverzity neustále predmetom diskusií (napr. Laštůvka 1989, 1996; Beneš et al. 2002; Endel & Panigaj 2022). Ich význam je najmä vo vzťahu k ochrane fauny, tzn. pri analýzach zmien veľkosti areálu, pri posudzovaní citlivosti druhov k zásahom do ekosystému, pri hodnotení antropickej záťaže, prípadne stability a pri vytváraní koncepcií rozvoja určitých území. Je to dôležité najmä pre druhy alebo skupiny s bioindikačnými vlastnosťami, akými sú napríklad aj viaceré druhy motýľov (Lepidoptera). Menovaní autori poukázali na viaceré faktory spôsobujúce v súčasnosti pokles záujmu o faunistické výskumy. Napriek tomu, na ich veľký význam poukázali posledné globálne meta-analýzy (van Klink et. al. 2020, 2023) potvrdzujúce celosvetový pokles hmyzu. Poznanie biodiverzity hlavne väčších oblastí je podmienené dlhodobými výskumami. Príkladom poznania lepidopterofauny niektorých väčších území je mnohoročná práca profesora Reipricha, ktorý sa zaoberal intenzívnym výskumom Slovenského raja a neustále nachádzal nové, doposiaľ nezistené druhy (napr. Reiprich 1960, 1972, 1996). Medzi ďalšie pomerne dobre zmapované územia patria aj Slovenský kras, Vysoké Tatry a iné (pre bližšie literárne zdroje od 1996 do 2020 pozri Endel & Panigaj 2022), ktoré boli v minulosti a aj v súčasnosti sú v pozornosti záujmu viacerých lepidopterológov.

Pre menšiu pozornosť, ktorá bola v minulosti venovaná územiu Ondavskej vrchoviny, začal autorom predkladaného príspevku (cf. Csanády 2021) v roku 2008 intenzívnejší výskum zameraný na faunistické mapovanie denných motýľov kultúrnej krajiny sledovaného územia. Doterajším výskumom bolo potvrdené pre územie Ondavskej vrchoviny 88 druhov denných motýľov patriacich do šiestich čeľadí.

Hlavným cieľom predkladaného príspevku bolo preto nadviazať na už známe poznatky o biodiverzite denných motýľov v ekosystémoch antropogénne pozmenenej krajiny.

Materiál a metodika

V rokoch 2019 – 2023 bolo uskutočnené faunistické mapovanie denných motýľov v okolí šiestich obcí východného Slovenska na území Ondavskej vrchoviny počas 27 termínov (pozri nižšie): Šandal (49°11‘15“N, 21°36‘26“E, 272 – 327 m n.m.), Kručov (49°06‘50“N, 21°36‘59“E, 202 – 230 m n.m.), Vyšná Olšava (49°09‘33“N, 21°35‘35“E, 209 – 314 m n.m.), Ondavka (49°26‘02“N, 21°20‘06“E, 511 – 540 m n.m.), Veľkrop (49°14‘05“N, 21°44‘30“E, 276 – 300 m n.m.) a Potôčky (49°12‘20“N, 21°42‘55“E, 264 – 304 m n.m.), Obrázok 1–6.

Výskum bol realizovaný entomologickou sieťkou alebo priamym pozorovaním v priebehu mesiacov máj až október na vybraných študijných plochách použitím

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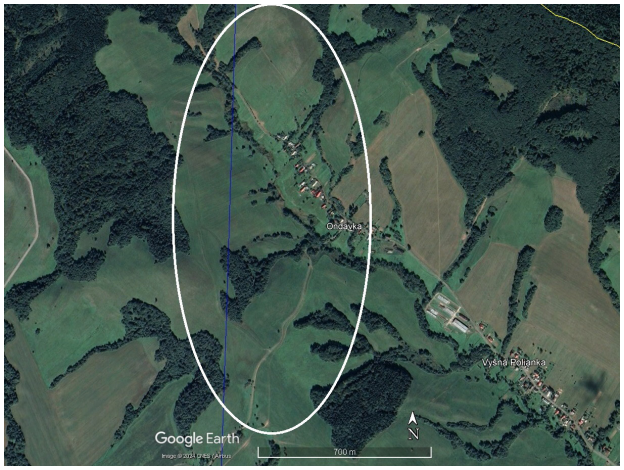
„zig-zag“ metódy pri prechode územím katastra obcí bez ohľadu na typ biotopu (plocha ohraničená bielou farbou, Obrázok 1–6). Podrobnejšie informácie o spôsobe odchytu sú uvedené aj v predchádzajúcich prácach (napr. Csanády 2019, 2020, 2021).

Motýle boli predovšetkým zaznamenané na lúčnych stanovištiach a biotopoch, ktoré sú typické ich najčastejším výskytom. Okrem toho, bola pozornosť sústredená aj na rôzne krovité zárasty, ruderálne plochy, remízky, okraje lesných, poľných, vodných či podmáčaných biotopov. Všetky zaznamenané letiace resp. sediace jedince boli determinované priamo teréne. Odchyteným jedincom boli šetrným spôsobom zotrené krídelné šupiny na apexe krídiel (tzn. vrchol, predný roh krídla motýľa) tak aby nedošlo k poškodeniu krídel a aby sa predišlo ich opätovnému spočítaniu. Údaje o výskyte druhov boli zaznamenané do terénneho protokolu a len v nevyhnutnom prípade boli ťažko určiteľné druhy odoberané k ďalšiemu laboratórnemu spracovaniu kopulačných orgánov a determinované pomocou určovacích kľúčov a atlasov (Jakšić 1998; Slamka 2004).

Obrázok 1. Študijná plocha v okolí obce Šandal (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).

Obrázok 2. Študijná plocha v okolí obce Kručov (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).

Obrázok 3. Študijná plocha v okolí obce Vyšná Olšava (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).



Obrázok 4. Študijná plocha v okolí obce Ondavka (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).

Obrázok 5. Študijná plocha v okolí obce Veľkrop (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).

Obrázok 6. Študijná plocha v okolí obce Potôčky (Zdroj: Image©2024 CNES / Airbus, Image©2024 Maxar Technologies).

Všetky zaznamenané druhy motýľov boli zaradené do príslušných čeľadí podľa systematickej klasifikácie (Pastorális 2022).

Motýle boli rozdelené do piatich skupín na základe biotopovej väzby podľa práce Macek et al. 2015:
ubikvista (U) – druh schopný žiť na všetkých biotopoch, vrátane agrocenóz a ruderálov; mezofil-1 (M1) – druh žijúci na otvorených biotopoch predovšetkým na mezofilných lúkach; mezofil-2 (M2) – druh preferujúci rozhranie lesných a lúčnych biotopov, lesné lúky a čistinky a pod.; mezofil-3 (M3) – druh žijúci v lesných biotopoch; xerotermofil-1 (X1) – druh žijúci na otvorených xerotermných biotopoch, prevažne na nízko stebelných stepných trávnikoch a skalných stepiach; xerotermofil-2 (X2) – lesostepný a krovinový druh; hygrofil-1 (H1) – druh žijúci na otvorených podmáčaných biotopoch ako sú podmáčané lúky a slatiny (eutrofne mokrade); hygrofil-2 (H2) – druh žijúci v podmáčaných lesoch (podmáčané smrečiny, vŕbovo-topoľové lužné lesy, jelšiny, pobrežná krovinná vegetácia); tyrfofil (T) – druh oligotrofných mokradí, buď tyrfobiontný (žijúci len na rašeliniskách) alebo tyrfofilný (preferujúci rašeliniská). V prípade, ak má druh dve biotopové optimá, sú uvedené obe.
Podľa faunistického typu rozšírenia (tzn. na základe ich recentných areálov rozšírenia), boli rozdelené do nasledujúcich ôsmich kategórií, ktoré upravili Macek et al. (2015): kozmopolitný typ (KOS) – druh rozšírený alebo zavlečený na väčšine kontinentov; holarktický typ (HOL) – druh rozšírený alebo zavlečený v palearktickej a nearktickej oblasti; paleotropický typ (PAL) – druh rozšírený od severnej Afriky cez Európu až do východnej Ázie a Japonska; eurosibírsky typ (ESI) – druh rozšírený prevažne v severnej časti palearktickej oblasti od Európy po Ďaleký východ (aj druhy s disjunktnými areálmi); západopalearktický typ (WPA) – druh rozšírený v západnej polovici palearktickej oblasti, vrátane severnej Afriky; európsky typ (EUR) – druh rozšírený len v Európe; mediteránny typ (MED) – druh rozšírený prevažne v oblasti okolo Stredozemného mora a prípadne v úzkom páse až do Strednej Ázie a prenikajúce rôzne ďaleko na sever do strednej Európy; pontomediteránny typ (PME) – druhy rozšírené prevažne v juhovýchodnej Európe, Prednej Ázii a často zasahujúce až do Strednej Ázie.
Na základe mobility boli motýle rozdelené do deviatich kategórii: extrémne sedentárny (1); veľmi sedentárny (2); sedentárny (3); skôr sedentárny (4); menej sedentárny (5); ochotný rozptýlenia (6); mobilný (6); veľmi mobilný (8); extrémne moblný (9) (Bartonova et al. 2014).
Podľa zraniteľnosti a ohrozenosti boli motýle zaradené do piatich kategórii podľa práce Kulfan & Kulfan (2001): zraniteľný (VU); ohrozený (EN); najmenej ohrozený (LC); takmer ohrozený (NT); nedostatočné údaje (DD).
Podľa klasifikácie Tischler (1949) boli všetky druhy zaradené do piatich stupňov dominancie: eudominantný (Ed) > 10,0 %; dominantný (Do) 5 až 9,9 %; subdominantný (Su) 2 až 4,9 %; recedentné (Re) 1 až 1,9 % a subrecedentný (Sr) < 0,9 %.
Na porovnanie druhovej zhody (podobnosti) porovnávaných študijných lokalít boli použité indexy identity: Jaccardov index (Ja) a Sörensenov index (Sö). Druhová rozmanitosť bola vyjadrená pomocou Shannon-Weinerovho indexu diverzity (H) a Pielovho indexu vyrovnanosti (J). Na vypočítanie príslušných indexov bol použitý štatistický program PAST verzia 3.11 (Hammer et al. 2001).

Lokality a dátumy odchytov

Šandal: motýle boli zaznamenané počas 4 termínov na vybranej študijnej ploche (ohraničená bielym kruhom) západne od obce s cieľom pokryť čo najväčšie spektrum biotopov (Obrázok 1): 26.07.2019; 10.07.2020; 14.08.2020; 08.09.2020.

Kručov: motýle boli zaznamenané počas 4 termínov severovýchodne od obce na vybraných študijných plochách (Obrázok 2): 26.07.2019; 09.07.2020; 13.08.2020; 10.09.2020.

Vyšná Olšava: motýle boli zaznamenané počas 4 termínov juhozápadne od obce na vybranej študijnej ploche (Obrázok 3): 10.06.2022; 08.07.2022; 26.08.2022; 07.10.2022.

Ondavka: motýle boli zaznamenané počas 4 termínov juhozápadne a severozápadne od obce na vybranej študijnej ploche s veľkým spektrom biotopov (Obrázok 4): 06.05.2022; 09.06.2022; 07.07.2022; 27.08.2022.

Veľkrop: motýle boli zaznamenané počas 5 termínov juhozápadne od obce na vybranej výskumnej ploche (Obrázok 5): 05.05.2023; 04.06.2023; 05.07.2023; 01.09.2023; 06.10.2023.

Potôčky: motýle boli zaznamenané počas 6 termínov východne a juhozápadne od obce na vybraných študijných

plochách s väčším spektrom biotopov (Obrázok 6): 06.05.2023; 03.06.2023; 06.07.2023; 03.08.2023; 02.09.2023; 06.10.2023.

Výsledky a Diskusia

Počas prieskumu lepidopterofauny v rokoch 2019 – 2023 bolo celkovo zaznamenaných 3 765 jedincov 68 druhov motýľov s dennou aktivitou (Papilionoidea) patriacich do 5 čeľadí. Pre jednotlivé obce bol zistený rôzny počet druhov a zaznamenaných jedincov (Tabuľka 1, Príloha 1). Celkovo bolo zaznamenaných 22 spoločných druhov pre všetky porovnávané lokality.

Tabuľka 1. Druhová početnosť, početnosť jedincov a hodnoty indexov diverzity a vyrovnanosti spoločenstva motýľov v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
Počet druhov	45	44	43	45	43	45
Počet jedincov	680	598	669	551	561	706
Shannon-Weinerov index diverzity (H)	3,05	2,88	2,78	2,95	2,63	2,66
Pielov index vyrovnanosti (J)	0,80	0,76	0,74	0,78	0,70	0,70

Podľa afinity motýľov k biotopom bolo zaznamenaných deväť skupín s približne vyrovnaným počtom v porovnávaných lokalitách (Tabuľka 2), pričom dominovali ubikvistické, mezofilné a xerotermofilné druhy v lepidopterocenózach. Uvedené údaje spolu s predchádzajúcimi výskumami (napr. Csanády 2020, 2021, 2024) potvrdili významnosť biotopov antropogénnej krajiny pre zachovanie väčšej biodiverzity denných motýľov (Tabuľka 1).

Tabuľka 2. Zastúpenie denných motýľov (počet druhov / %) v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko) rozdelené podľa ich biotopovej väzby (Macek et al. 2015).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
U	12 / 26,7	12 / 27,3	12 /27,9	11 / 24,4	11 / 25,6	11 / 24,4
H1	1 / 2,2	1 / 2,3	1 / 2,3	1 / 2,2	1 / 2,3	1 / 2,2
H2	2 / 4,4	1 / 2,3	2 / 4,7	3 / 6,7	2 / 4,7	1 /2,2
M1	6 / 13,3	6 / 13,6	7 / 16,3	10 / 22,2	6 / 14,0	7 / 15,6
M2	11 / 24,4	10 / 22,7	8 / 18,6	10 / 22,2	11 / 25,6	10 / 22,2
M3	2 / 4,4	2 / 4,5	2 / 4,7	2 / 4,4	3 / 7,0	2 / 4,4
X1	5 / 11,1	6 / 13,6	6 / 14,0	4 / 8,9	3 / 7,0	6 / 13,3
X2	6 / 13,3	6 / 13,6	5 /11,6	3 / 6,7	5 / 11,6	6 / 13,3
T	-	-	-	1 / 2,2	1 / 2,3	1 / 2,2

U: ubikvista, H1: hygrofil-1, H2: hygrofil-2, M1: mezofil-1, M2: mezofil-2, M3: mezofil-3, X1: xerotermofil-1, X2: xerotermofil-2, T: tyrfofil.

Podľa mobility motýľov bol pre jednotlivé lokality (Tabuľka 3), potvrdený výskyt predovšetkým sedentárnych druhov s menšou či väčšou afinitou k prostrediu. *Satyrium pruni* L., patriaci k extrémne sedentárnym druhom bol potvrdený na dvoch lokalitách (Vyšná Olšava a Veľkrop). Jeho výskyt je viazaný na živnú rastlinu akou je divo rastúca slivka trnková, *Prunus spinosa* L. (Beneš et al. 2002; Bartonova et al. 2014). Medzi ďalšie druhy denných motýľov viazané silne na biotop patrili *Cupido decolorata* Staud., *Coenonympha glycerion* Brkh., *Brenthis ino* Rott., *Melitaea diamina* Lang, patriace k veľmi sedentárnym druhom. Výskyt týchto druhov je viazaný predovšetkým na špecifické habitatové nároky (Beneš et al. 2002). Zároveň, *B. ino* a *M. diamina* sú zároveň zaradené k zraniteľným (VU) druhom na území Slovenskej republiky (Kulfan & Kulfan 2001).

Tabuľka 3. Zastúpenie denných motýľov (počet druhov / %) v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko) rozdelené podľa ich mobility (Bartonova et al. 2014).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
1	-	-	1 / 2,3	1 / 2,2	1 / 2,3	1 /2,2
2	2 / 4,4	2 / 4,5	2 / 4,7	3 / 6,7	2 / 4,7	1 / 2,2
3	16 / 35,6	14 / 31,8	15 / 34,9	16 / 35,6	14 / 32,6	17 / 37,8
4	11 / 24,4	9 / 20,5	8 / 18,6	9 / 20,0	8 / 18,6	10 / 22,2
5	5 / 11,1	7 / 15,9	4 / 9,3	5 / 11,1	6 / 14,0	6 / 13,3
6	3 / 6,7	3 / 6,8	4 / 9,3	3 / 6,7	5 / 11,6	2 /4,4
7	6 / 13,3	6 / 13,6	6 / 14,0	6 / 13,3	6 / 14,0	6 / 13,3
8	-	1 /2,3	1 / 2,3	-	-	1 / 2,2
9	2 / 4,4	2 /4,5	2 / 4,7	2 / 4,4	1 / 2,3	1 /2,2

1: extrémne sedentárne, 2: veľmi sedentárne, 3: sedentárne, 4: skôr sedentárne, 5: menej sedentárne, 6: ochotné rozptýlenia, 7: mobilné, 8: veľmi mobilné, 9: extrémne mobilné.

Na základe faunistického typu rozšírenia motýľov (Tabuľka 4) bolo zaznamenaných 8 rôznych faunistických typov, z ktorých dominovali predovšetkým palearktické, západopalearktické a eurosibírske druhy. Výskyt týchto druhov je v zhode s lokalizáciou Slovenska v rámci Európy. Pre všetky porovnané lokality vyšli podobné počty jednotlivých skupín, čo nie je vzhľadom na ich blízkosť prekvapujúce. Výskyt teplomilnejších druhov motýľov patriacich k pontomediteránnemu a mediteránnemu faunistickému prvku poukazuje aj na teplomilný ráz lepidopterofauny východného Slovenska (Panigaj 2000; Csanády 2021).

Odchyty potvrdili prítomnosť viacerých druhov (Tabuľka 5) zaradených medzi druhy zraniteľné (VU) ohrozené (EN) a takmer ohrozené (NT), cf. Kulfan & Kulfan (2001); van Swaay et al. (2010): *Iphiclides podalirius, Carcharodus floccifera*, *Lycaena dispar*, *Glaucopsyche alexis*, *Pseudophilotes vicrama*, *Phengaris arion*, *Fabriciana laodice*, *Brenthis ino*, *Melitaea diamina, M. phoebe*. Ich potvrdenie dokladuje dôležitosť jednotlivých pozorovaní a faunistického výskumu aj na územiach značne ovplyvnených antropogénnou činnosťou.

Tabuľka 4. Zastúpenie denných motýľov (počet druhov / %) v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko) rozdelené podľa ich faunistického typu rozšírenia (Macek et al. 2015).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
KOS	2 / 4,4	2 / 4,5	2 / 4,7	2 / 4,4	1 / 2,3	1 / 2,2
HOL	5 / 11,1	4 / 9,1	5 / 11,6	4 / 8,9	5 / 11,6	5 /11,1
PAL	23 / 51,1	22 / 50,0	19 / 44,2	21 / 46,7	20 / 46,5	20 / 44,4
ESI	8 / 17,8	6 / 13,6	8 / 18,6	11 / 24,4	7 / 16,3	11 / 24,4
WPA	6 / 13,3	7 / 15,9	6 / 14,0	6 / 13,3	8 / 18,6	6 /13,3
EUR	-	1 / 2,3	-	-	-	-
MED	-	1 / 2,3	1 / 2,3	-	-	1 / 2,2
PME	1 / 2,2	1 / 2,3	2 / 4,7	1 / 2,2	2 / 4,7	1 / 2,2

KOS: kozmopolitný, HOL: holarktický, PAL: palearktický, ESI: eurosibírsky, WPA: západopalearktický, EUR: európsky, MED: mediteránny, PME: pontomediteránny.

Tabuľka 5. Zastúpenie denných motýľov (počet druhov / %) v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko) rozdelené podľa ich zraniteľnosti a ohrozenosti motýľov (Kulfan & Kulfan 2001).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
VU	3 / 6,7	2 / 4,5	2 / 4,7	3 / 6,7	3 / 7,0	2 / 4,4
LC	40 / 88,9	42 / 95,5	40 / 93,0	41 / 91,1	39 / 90,7	43 / 95,6
NT	2 / 4,4	-	1 / 2,3	-	1 / 2,3	-
EN	-	-	-	1 / 2,2	-	-

VU: zraniteľný, LC: najmenej ohrozený, NT: takmer ohrozený, EN: ohrozený.

Tabuľka 6. Zastúpenie denných motýľov (počet druhov / %) v okolí šiestich obcí Ondavskej vrchoviny (východné Slovensko) rozdelené podľa ich dominancie (Tischler 1949).

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
Ed	2 / 4,4	1 / 2,3	4 / 9,3	3 / 6,7	1 / 2,3	2 /4,4
Do	1 / 2,2	5 / 11,4	3 / 7,0	-	4 / 9,3	2 / 4,4
Su	13 / 28,9	6 / 13,6	2 / 6,7	10 / 22,2	6 /14,0	4 / 8,9
Re	7 / 15,6	10 / 22,7	8 / 18,6	8 / 17,8	8 / 18,6	10 / 22,2
Sr	22 / 48,9	22 / 50,0	26 / 60,5	24 / 53,3	24 / 55,8	27 / 60,0

Ed: eudominantný, Do: dominantný, Su: subdominantný, Re: recedentný, Sr: subrecedentný

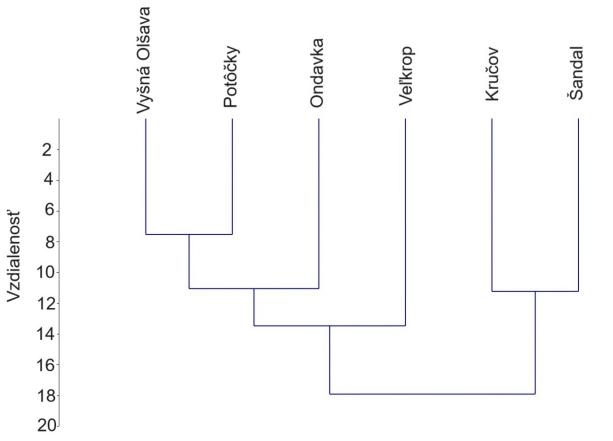
Motýle a ich početnosti zo študijných lokalít boli navzájom porovnané (Príloha 1) a bolo zaznamenaných 22 spoločných druhov, z ktorých viaceré druhy mali zároveň eudominantné, dominantné alebo subdominantné zastúpenie v spoločenstve denných motýľov na oboch študijných plochách (Tabuľka 6, Príloha 1). O druhovej podobnosti spoločenstiev denných motýľov svedčia aj vysoké počty spoločných druhov, ako aj hodnoty indexov identity (Tabuľka 7, 8), Jaccardovho (Ja) a Sörensenovho indexu (Sö). Zároveň, dendrogram kvantitatívnej zhlukovej analýzy na základe údajov Sörensenovho indexu podobnosti z porovnávaných lokalít (Obrázok 7) ukázal, ktoré lokality sa medzi sebou najviac podobali. Z oboch, tzn. z dendrogramu ako aj z tabuľky je viditeľná veľká podobnosť lepidopterocenóz medzi lokalitami. Napriek tomu, na tomto mieste treba podotknúť, že dve lokality (Šandal a Kručov) vykazujúce veľkú podobnosť vytvárajú samostatný zhluk úplne oddelený od ostatných štyroch porovnávaných lokalít (pozri dendrogram). To bolo spôsobené, nerovnomernosťou vstupných údajov, keďže na nich boli urobené sledovania predovšetkým koncom sezóny a preto viaceré druhy jarného aspektu absentovali (napr. *A. cardamines* L., *P. malvae* L.,).

Tabuľka 7. Počet spoločných druhov na porovnávaných lokalitách.

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop
Kručov	39				
Vyšná Olšava	34	31			
Ondavka	37	34	35		
Veľkrop	32	30	32	32	
Potôčky	34	34	33	36	34

Tabuľka 8. Porovnanie lepidopterocenóz na základe Jaccardovho indexu podobnosti (Ja) – nad diagonálou, Sörensenovho indexu (Sö) podobnosti – pod diagonálou.

	Šandal	Kručov	Vyšná Olšava	Ondavka	Veľkrop	Potôčky
Šandal	-	78,0	62,9	69,8	57,1	60,7
Kručov	87,6	-	55,4	61,8	52,6	61,8
Vyšná Olšava	77,3	71,3	-	66,0	59,3	60,0
Ondavka	82,2	76,4	79,5	-	57,1	66,7
Veľkrop	72,7	69,0	74,4	72,7	-	63,0
Potôčky	75,6	76,4	75,0	80,0	77,3	-



Obrázok 7. Dendrogram kvantitatívnej zhlukovej analýzy (Euklidovská vzdialenosť) podobnosti lokalít na základe údajov Sörensenovho indexu podobnosti.

Čeľaď Papilionidae bola zastúpená dvomi druhmi, ktoré napriek nízkym početnostiam (Príloha 1), predstavovali stálu

zložku lepidopterocenóz na sledovaných územiach. Výskyt týchto druhov bol potvrdený aj v iných oblastiach Ondavskej vrchoviny (Csanády 2021). Významný je najmä výskyt druhu *I. podalirius* L., vo vzťahu k druhovej a územnej ochrane (Tabuľka 5), keďže predstavuje takmer ohrozený (NT) druh na Slovensku (Kulfan & Kulfan 2001).
Sedem druhov bolo zaznamenaných z čeľade Hesperiidae, pričom tri druhy (*O. sylvanus* Esp., *T. sylvestris* Poda, a *T. lineola* Ochs., Príloha 1), boli spoločné pre všetky skúmané lokality, aj keď s odlišným stupňom dominancie (Príloha 1). Z faunistického hľadiska, bol významným záznam jedincov druhu *Carcharodus flociffera* Zell. na území Ondavky, ktorý patrí k ohrozeným (EN) druhom zaradeným do Červeného zoznamu Slovenskej republiky (Kulfan & Kulfan 2001).

Celkovo bolo z čeľade Pieridae zaznamenaných deväť druhov, všetky bežne prítomne nielen na území Ondavskej vrchoviny (Csanády 2021), ale aj v agrárnej a kultúrnej krajine vo všeobecnosti (Laštůvka 2008). Pre všetky porovnávané lokality bolo zaznamenaných päť spoločných druhov (Príloha 1), s dominanciou najmä zástupcov dvoch rodov *Leptidea* a *Pieris*, čo je opäť charakteristické pre celú skúmanú oblasť.
Z čeľade Lycaenidae bolo zaznamenaných 18 druhov, so štyrmi druhmi spoločnými (Príloha 1) pre všetkých šesť porovnávaných lokalít. Dominancia jednotlivých druhov pre uvedené lokality bola rôzna, ale vo všeobecnosti v lepidopterocenózach prevládali druhy: *Lycaena virgaureae* L., *Cupido argiades* Pall., *Plebejus argus* L. a *Polyommatus icarus* Rott. Z biodiverzitného a ochranárskeho hľadiska sú významnými potvrdenia výskytu *Lycaena dispar* Haw, *Pseudophilotes vicrama* Moore, *Phengaris arion* L. pretože sú zaradené v Červenom zozname Slovenskej republiky k zraniteľným (VU) druhom (Kulfan & Kulfan 2001). *L. dispar* a *P. arion* zároveň patria k chráneným druhom európskeho významu (Pastorális et al. 2013). Výskyt ostatných druhov na sledovaných lokalitách nebol ničím prekvapujúcim (cf. Csanády 2021).
Druhovo najpočetnejšiu skupinu denných motýľov predstavovala čeľaď Nymphalidae s 32 druhmi (Príloha 1), ale spoločných pre všetky porovnávané lokality bolo len 9 druhov s výrazným rozdielom v ich početnosti. Druhy uvedené v ČZ SR so súčasným statusom takmer ohrozených (NT) a zraniteľných (VU) boli tiež potvrdené (*Fabriciana laodice* Den. et Schiff., *Brenthis ino* Rott., *Melitaea diamina* Lang, *M. phoebe* Den. et Schiff.).
Údaje o spoločenstvách denných motýľov v sledovaných lokalitách naznačili výskyt viacerých vzácnych a ohrozených druhov s afinitou predovšetkým na xerotermné či hygrofilné biotopy otvorenej krajiny.

Poďakovanie
Poďakovanie patrí recenzentom príspevku za ich veľmi podnetné pripomienky, ktoré pomohli zlepšiť kvalitu príspevku. Poďakovanie patrí aj všetkým obyvateľom skúmaných obcí za ich trpezlivosť a ústretovosť počas výskumu. Výskum bol realizovaný aj vďaka finančnej podpore Východoslovenskej distribučnej a.s.

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Príloha 1. Systematický prehľad zaznamenaných denných motýľov (nomenklatúra podľa Pastorális 2022) šiestich obcí Ondavskej vrchoviny (východné Slovensko).

	Šandal		Kručov		Vyšná Olšava		Ondavka		Velkrop		Potôčky		Biotopová väzba	Mobilita	Faunistický typ	Červený zoznam SR
	n	D%	n	D%	n	D%	n	D%	n	D%	n	D%				
Papilionidae																
Iphiclides podalirius L.	1	0,2	-	-	1	0,1	-		1	0,2	-	-	X2	4	PAL	**NT**
Papilio machaon L.	2	0,3	1	0,2	1	0,1	6	1,1	1	0,2	9	1,3	U	5	HOL	LC
Hesperiidae																
Ochlodes sylvanus Esp.	3	0,4	2	0,3	4	0,6	11	2,0	4	0,7	6	0,8	U	4	PAL	LC
Hesperia comma L.	1	0,2	-	-	-	-	2	0,3	-	-	2	0,3	X1	3	HOL	LC
Thymelicus sylvestris Poda	8	1,2	4	0,7	41	6,1	7	1,3	50	8,9	51	7,2	M2	3	WPA	LC
Thymelicus lineola Ochs.	1	0,2	10	1,7	9	1,3	15	2,7	25	4,5	4	0,6	M1	4	PAL	LC
Carcharodus floccifera Zell.	-	-	-	-	-	-	1	0,2	-	-	-	-	M1	3	PLA	**EN**
Erynnis tages L.	2	0,3	-	-	16	2,4	2	0,3	-	-	10	1,4	X1	3	ESI	LC
Pyrgus malvae L.	-	-	-	-	-	-	-	-	2	0,4	1	0,1	M2	3	PAL	LC
Pieridae																
Leptidea juvernica Will.	7	1,0	6	1,0	3	0,4	27	4,9	2	0,4	-	-	H2, M2	6	WPA	LC
Leptidea sinapis L.	9	1,3	8	1,3	8	1,2	2	0,3	3	0,5	7	1,0	X2, M2	6	PAL	LC
Gonepteryx rhamni L.	2	0,3	2	0,3	8	1,2	5	0,9	11	2,0	8	1,1	M2, M3	7	PAL	LC
Colias hyale L.	7	1,0	3	0,5	4	0,6	2	0,3	2	0,4	9	1,3	U	7	ESI	LC
Colias crocea Frcr.	-	-	2	0,3	1	0,1	-		-	-	6	0,8	U	8	MED	LC
Pieris brassicae L.	1	0,2	4	0,7	-	-	-		-	-	-	-	U	7	PAL	LC
Pieris rapae L.	27	4,0	43	7,2	8	1,2	13	2,4	13	2,3	23	3,3	U	7	KOS	LC
Pieris napi L.	8	1,2	12	2,0	10	1,5	9	1,6	4	0,7	8	1,1	U	7	PAL	LC
Antocharis cardamines L.	-	-	-	-	-	-	1	0,2	13	2,3	5	0,7	M1, H1	4	PAL	LC
Lycaenidae																
Lycaena phleas L.	1	0,2	1	0,2	1	0,1	-	-	1	0,2	4	0,6	U	4	HOL	LC
Lycaena dispar Haw.	1	0,2	-	-	6	0,9	2	0,3	9	1,6	5	0,7	H1, M2	3	ESI	**VU**
Lycaena virgaureae L.	16	2,4	8	1,3	-	-	18	3,3	6	1,1	17	2,4	M2, M3	4	PAL	LC
Lycaena tityrus Poda	7	1,0	8	1,3	1	0,1	2	0,3	1	0,2	1	0,1	M1, X1	3	WPA	LC
Lycaena hippothoe L.	-	-	-	-	2	0,3	11	2,0	-	-	-	-	M1, H1	3	ESI	LC
Satyrium pruni L.	-	-	-	-	1	0,1	-	-	1	0,2	-	-	X2, M2	1	PAL	LC
Satyrium acaciae F.	-	-	-	-	-	-	-	-	9	1,6	9	1,3	X2	5	PME	LC
Cupido minimus Fues.	-	-	-	-	1	0,1	-	-	-	-	1	0,1	X1	3	ESI	LC
Cupido argiades Pall.	29	4,3	13	2,2	6	0,9	12	2,2	22	3,9	13	1,8	X1, H1	5	PAL	LC
Cupido decolorata Staud.	3	0,4	2	0,3	1	0,1	3	0,5	6	1,1	-	-	X1	2	PME	LC
Celastrina argiolus L.	1	0,2	3	0,5	-	-	-	-	2	0,4	-	-	M2, M3	5	PAL	LC
Pseudophilotes vicrama Moore	-	-	-	-	6	0,9	-	-	-	-	-	-	X1	3	PME	**VU**
Phengaris arion L.	4	0,6	1	0,2	-	-	-	-	-	-	-	-	X1	3	PAL	**VU**
Plebejus argus L.	21	3,1	8	1,3	42	6,3	1	0,2	200	35,7	230	32,6	H1, X1	3	PAL	LC
Plebejus argyrognomon Brgstr.	-	-	2	0,3	-	-	-	-	-	-	-	-	X1, M1	3	EUR	LC
Aricia agestis Den. et Schiff.	-	-	2	0,3	-	-	-	-	-	-	-	-	X1, M1	4	PAL	LC
Cyaniris semiargus Rott.	1	0,2	-	-	5	0,7	2	0,3	-	-	-	-	M1, H1	4	PAL	LC
Polyommatus icarus Rott.	22	3,2	15	2,5	74	11,1	76	13,8	17	3,0	32	4,5	U	3	PAL	LC
Nymphalidae																
Pararge aegeria L.	-	-	-	-	-	-	-	-	2	0,4	1	0,1	M3, X3	4	WPA	LC
Coenonympha pamphilus L.	51	7,5	24	4,0	76	11,4	21	3,8	45	8,0	32	4,5	M1, X1	3	WPA	LC
Coenonympha glycerion Brkh.	13	1,9	16	2,7	24	3,6	2	0,3	6	1,1	9	1,3	X2, H2	2	ESI	LC
Erebia aethiops Esp.	-	-	-	-	-	-	-	-	-	-	3	0,4	M2, X2	3	EUR	LC
Erebia medusa Den. et Schiff.	-	-	-	-	2	0,3	9	1,6	6	1,1	4	0,6	M2	3	ESI	LC

Príloha 1. Pokračovanie.

Aphantopus hyperanthus L.	23	3,4	11	1,8	70	10,5	105	19,1	-	-	3	0,4	M1, M2	3	PAL	LC
Maniola jurtina L.	127	18,7	154	25,8	140	20,9	83	15,1	28	5,0	110	15,6	U	4	WPA	LC
Melanargia galathea L.	16	2,4	16	2,7	50	7,5	7	1,3	2	0,4	1	0,1	M1	5	WPA	LC
Minois dryas Sc.	24	3,5	3	0,5	-	-	-	-	-	-	6	0,8	X2, H2	3	ESI	LC
Brintesia circe F.	-	-	1	0,2	-	-	-	-	-	-	-	-	X2	5	WPA	LC
Argynnis paphia L.	29	4,3	47	7,9	2	0,3	3	0,5	-	-	1	0,1	M3	4	ESI	LC
Speyeria aglaja L.	28	4,1	2	0,3	-	-	2	0,3	-	-	1	0,1	M2, X2	3	PAL	LC
Fabriciana adippe Den. et Schiff.	24	3,5	6	1,0	2	0,3	7	1,3	7	1,2	4	0,6	M2	3	PAL	LC
Fabriciana laodice Pall.	5	0,7	-	-	-	-	-	-	-	-	-	-	M2, M3	4	ESI	**NT**
Issoria lathonia L.	-	-	-	-	1	0,1	-	-	-	-	-	-	U	7	PAL	LC
Brenthis ino Rott.	-	-	-	-	-	-	6	1,1	-	-	-	-	H2, M2	2	ESI	**VU**
Brenthis daphne Den. et Schiff.	2	0,3	1	0,2	4	0,6	4	0,7	-	-	3	0,4	X2, M2	4	PAL	LC
Boloria selene Den. et Schiff.	19	2,8	7	1,2	2	0,3	20	3,6	2	0,4	3	0,4	M2, T	3	HOL	LC
Boloria dia L.	-	-	1	0,2	-	-	1	0,2	-	-	5	0,7	M1, X2	5	ESI	LC
Apatura ilia Den. et Schiff.	1	0,2	4	0,7	-	-	1	0,2	-	-	-	-	M3	4	ESI	LC
Apatura iris L.	-	-	-	-	-	-	-	-	1	0,2	-	-	M3	3	ESI	LC
Nymphalis antiopa L.	-	-	-	-	1	0,1	-	-	1	0,2	-	-	M3	6	HOL	LC
Nymphalis polychloros L.	-	-	-	-	-	-	-	-	1	0,2	-	-	M2, M3	6	WPA	LC
Aglais urticae L.	-	-	-	-	2	0,3	5	0,9	1	0,2	1	0,1	U	7	PAL	LC
Aglais io L.	5	0,7	31	5,2	-	-	5	0,9	2	0,4	5	0,7	U	7	PAL	LC
Vanessa atalanta L.	4	0,6	2	0,3	7	1,0	4	0,7	3	0,5	8	1,1	U	9	HOL	LC
Vanessa cardui L.	6	0,9	2	0,3	2	0,3	10	1,8	-	-	-	-	U	9	KOS	LC
Polygonia c-album L.	2	0,3	6	1,0	4	0,6	2	0,3	2	0,4	3	0,4	M2, M3	6	PAL	LC
Araschnia levana L.	20	2,9	51	8,5	9	1,3	21	3,8	33	5,9	37	5,2	M2, H2	5	PAL	LC
Melitaea diamina Lang	-	-	-	-	-	-	1	0,2	4	0,7	1	0,1	T, H1	1	ESI	**VU**
Melitaea phoebe Den. et Schiff.	2	0,3	1	0,2	-	-	-	-	1	0,2	-	-	X2	3	PAL	**VU**
Melitaea athalia Rott.	94	13,8	52	8,7	11	1,6	2	0,3	9	1,6	4	0,6	M2, X2	3	PAL	LC
Spolu	**680**		**598**		**669**		**551**		**561**		**706**					

Biotopová väzba – U: ubikvistický druh, M1: mozofil-1, M2: mezofil-2, M3: mezofil-3, X1: xerotermofil, X2: xerotermofil-2, H: hygrofil, T: tyrfofil (podľa Beneš et al. 2002).
Stupeň ohrozenia – VU: zraniteľný, LC: najmenej ohrozený, NT: takmer ohrozený, EN: ohrozený (podľa Kulfan & Kulfan 2001).
Faunistický typ rozšírenia – KOS: kozmopolitný, HOL: holarktický, PAL: palearktický, ESI: eurosibírsky, WPA: západopalearktický, EUR: európsky, MED: mediteránny, PME: pontomediteránny (Macek et al. 2015).
Mobilita – 1: extrémne sedentárne, 2: veľmi sedentárne, 3: sedentárne 4: skôr sedentárne, 5: menej sedentárne, 6: ochotné rozptýlenia, 7: mobilné, 8: veľmi mobilné, 9: extrémne mobilné (Bartonova et al. 2014).
Spoločné druhy a stupeň dominancie druhov – oranžová farba: spoločné druhy na všetkých lokalitách, žltá farba: eudominantný, červená farba: dominantný, modrá farba: subdominantný, zelená farba: recedentný, sivá farba – subrecedentný druh (podľa Tischlera 1949).

Príloha 2. Prehľad motýľov podľa termínov odchytu a lokalít.

čeľaď Vidlochvostovité (Papilionidae) – 2 spp. (23 ex.):
***Iphiclides podalirius* (Linnaeus, 1758) – 3 ex.:** Šandal (1 ex.): 26.07.2019 – (1 ex.); Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Veľkrop (1 ex.): 05.05.2023 – (1 ex.).

***Papilio machaon* Linnaeus, 1758 – 20 ex.:** Šandal (2 ex.): 08.09.2020 – (2 ex.); Kručov (1 ex.): 09.07.2020 – (1 ex.); Ondavka (6 ex.): 06.05.2022 – (3 ex.); 07.07.2022 – (1 ex.); 27.08.2022 – (2 ex.); Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Potôčky (9 ex.): 06.05.2023 – (5 ex.); 03.06.2023 – (3 ex.); 03.08.2023 – (1 ex.); Veľkrop (1 ex.): 05.05.2023 – (1 ex.).

čeľaď: Súmračníkovité (Hesperidae) – 7 spp. (294 ex.):
***Ochlodes sylvanus* (Esper, 1777) – 30 ex.:** Šandal (3 ex.): 14.08.2020 – (3 ex.); Kručov (2 ex.): 13.08.2020 – (2 ex.); Ondavka (11 ex.): 09.06.2022 – (6 ex.); 27.08.2022 – (5 ex.); Vyšná Olšava (4 ex.): 10.06.2022 – (3 ex.); 26.08.2022 – (1 ex.); Potôčky (6 ex.): 03.08.2023 – (3 ex.); 02.09.2023 – (3 ex.); Veľkrop (4 ex.): 04.06.2023 – (2 ex.); 01.09.2023 – (2 ex.).

***Hesperia comma* (Linnaeus, 1758) – 5 ex.:** Šandal (1 ex.): 14.08.2020 – (1 ex.); Ondavka (2 ex.): 27.08.2022 – (2 ex.); Potôčky (2 ex.): 03.08.2023 – (2 ex.).

***Thymelicus sylvestris* (Poda, 1761) – 161 ex.:** Šandal (8 ex.): 26.07.2019 – (2 ex.); 10.07.2020 – (6 ex.); Kručov (4 ex.): 09.07.2020 – (4 ex.); Ondavka (7 ex.): 07.07.2022 – (7 ex.); Vyšná Olšava (41 ex.): 08.07.2022 – (41 ex.); Potôčky (51 ex.): 06.07.2023 – (50 ex.); 03.08.2023 – (1 ex.); Veľkrop (50 ex.): 05.07.2023 – (50 ex.).

***Thymelicus lineola* (Ochsenheimer, 1808) – 64 ex.:** Šandal (1 ex.): 14.08.2020 – (1 ex.); Kručov (10 ex.): 09.07.2020 – (10 ex.); Ondavka (15 ex.): 07.07.2022 – (15 ex.); Vyšná Olšava (9 ex.): 08.07.2022 – (9 ex.); Potôčky (4 ex.): 06.07.2023 – (3 ex.); 03.08.2023 – (1 ex.); Veľkrop (25 ex.): 05.07.2023 – (25 ex.).

***Carcharodus floccifera* (Zeller, 1847) – 1 ex.:** Ondavka (1 ex.): 07.07.2022 – (1 ex.).

***Erynnis tages* (Linnaeus, 1758) – 30 ex.:** Šandal (2 ex.): 14.08.2020 – (2 ex.); Ondavka (2 ex.): 06.05.2022 – (2 ex.); Vyšná Olšava (16 ex.): 08.07.2022 – (14 ex.); 26.08.2022 – (2 ex.); Potôčky (10 ex.): 06.05.2023 – (5 ex.); 03.06.2023 – (2 ex.); 03.08.2023 – (3 ex.).

***Pyrgus malvae* (Linnaeus, 1758) – 3 ex.:** Potôčky (1 ex.): 06.07.2023 – (1 ex.); Veľkrop (2 ex.): 05.05.2023 – (1 ex.); 04.06.2023 – (1 ex.).

čeľaď Mlynárikovité (Pieridae) – 9 spp. (356 ex.):
***Leptidea juvernica* Williams, 1946 – 45 ex.:** Šandal (7 ex.): 14.08.2020 – (3 ex.); 10.07.2020 – (1 ex.); 14.08.2020 – (3 ex.); Kručov (6 ex.): 09.07.2020 – (3 ex.); 13.08.2020 – (3 ex.); Ondavka (27 ex.): 06.05.2022 – (18 ex.); 07.07.2022 – (9 ex.); Vyšná Olšava (3 ex.): 08.07.2022 – (2 ex.); 26.08.2022 – (1 ex.); Veľkrop (2 ex.): 05.07.2023 – (2 ex.).

***Leptidea sinapis* (Linnaeus, 1758) – 37 ex.:** Šandal (9 ex.): 26.07.2019 – (3 ex.); 10.07.2020 – (6 ex.); Kručov (8 ex.): 09.07.2020 – (3 ex.); 13.08.2020 – (5 ex.); Ondavka (2 ex.): 27.08.2022 – (2 ex.); Vyšná Olšava (8 ex.): 08.07.2022 – (5 ex.); 26.08.2022 – (3 ex.); Potôčky (7 ex.): 06.05.2023 – (3 ex.); 03.06.2023 – (1 ex.); 06.07.2023 – (1 ex.); 03.08.2023 – (1 ex.); 02.09.2023 – (1 ex.); Veľkrop (3 ex.): 05.05.2023 – (1 ex.); 04.06.2023 – (1 ex.); 05.07.2023 – (1 ex.).

***Gonepteryx rhamni* (Linnaeus, 1758) – 36 ex.:** Šandal (2 ex.): 26.07.2019 – (1 ex.); 10.07.2020 – (1 ex.); Kručov (2 ex.): 26.07.2019 – (1 ex.); 09.07.2020 – (1 ex.); Ondavka (5 ex.): 06.05.2022 – (3 ex.); 09.06.2022 – (1 ex.); 27.08.2022 – (1 ex.); Vyšná Olšava (8 ex.): 07.10.2022 – (8 ex.); Potôčky (8 ex.): 06.05.2023 – (4 ex.); 03.06.2023 – (1 ex.); 06.07.2023 – (1 ex.); 03.08.2023 – (2 ex.); Veľkrop (11 ex.): 05.05.2023 – (7 ex.); 05.07.2023 – (4 ex.).

***Colias hyale* (Linnaeus, 1758) – 27 ex.:** Šandal (7 ex.): 08.09.2020 – (7 ex.); Kručov (3 ex.): 26.07.2019 – (1 ex.); 10.09.2020 – (2 ex.); Ondavka (2 ex.): 09.06.2022 – (1 ex.); 27.08.2022 – (1 ex.); Vyšná Olšava (4 ex.): 26.08.2022 – (3 ex.); 07.10.2022 – (1 ex.); Potôčky (9 ex.): 02.09.2023 – (2 ex.); 06.10.2023 – (7 ex.); Veľkrop (2 ex.): 06.10.2023 – (2 ex.).

***Colias crocea* (Fourcroy, 1785) – 9 ex.:** Kručov (2 ex.): 13.08.2020 – (1 ex.); 10.09.2020 – (1 ex.); Vyšná Olšava (1 ex.): 07.10.2022 – (1 ex.); Potôčky (6 ex.): 03.08.2023 – (2 ex.); 06.10.2023 – (4 ex.).

***Pieris brassicae* (Linnaeus, 1758) – 5 ex.:** Šandal (1 ex.): 14.08.2020 – (1 ex.); Kručov (4 ex.): 09.07.2020 – (1 ex.); 13.08.2020 – (1 ex.); 10.09.2020 – (2 ex.).

***Pieris rapae* (Linnaeus, 1758) – 127 ex.:** Šandal (27 ex.): 26.07.2019 – (1 ex.); 10.07.2020 – (3 ex.); 14.08.2020 – (21 ex.); 08.09.2020 – (2 ex.); Kručov (43 ex.): 26.07.2019 – (2 ex.); 09.07.2020 – (24 ex.); 13.08.2020 – (11 ex.); 10.09.2020 – (6 ex.); Ondavka (13 ex.): 06.05.2022 – (1 ex.); 09.06.2022 – (1 ex.); 07.07.2022 – (5 ex.); 27.08.2022 – (6 ex.); Vyšná Olšava (8 ex.): 08.07.2022 – (3 ex.); 26.08.2022 – (5 ex.); Potôčky (23 ex.): 03.06.2023 – (3 ex.); 06.07.2023 – (4 ex.); 03.08.2023 – (3 ex.); 02.09.2023 – (10 ex.); 06.10.2023 – (3 ex.); Veľkrop (13 ex.): 05.05.2023 – (1 ex.); 05.07.2023 – (6 ex.); 01.09.2023 – (6 ex.).

***Pieris napi* (Linnaeus, 1758) – 51ex.:** Šandal (8 ex.): 14.08.2020 – (7 ex.); 08.09.2020 – (1 ex.); Kručov (12 ex.): 26.07.2019 – (3 ex.); 09.07.2020 – (4 ex.); 13.08.2020 – (3 ex.); 10.09.2020 – (2 ex.); Ondavka (9 ex.): 06.05.2022 – (4 ex.);

07.07.2022 – (4 ex.); 27.08.2022 – (1 ex.); Vyšná Olšava (10 ex.): 10.06.2022 – (4 ex.); 08.07.2022 – (3 ex.); 26.08.2022 – (2 ex.); 07.10.2022 – (1 ex.); Potôčky (8 ex.): 06.05.2023 – (4 ex.); 03.06.2023 – (2 ex.); 02.09.2023 – (1 ex.); 06.10.2023 – (1 ex.); Veľkrop (4 ex.): 05.05.2023 – (4 ex.).

***Anthocharis cardamines* (Linnaeus, 1758) – 19 ex.:** Ondavka (1 ex.): 06.05.2022 – (1 ex.); Potôčky (5 ex.): 06.05.2023 – (4 ex.); 03.06.2023 – (1 ex.); Veľkrop (13 ex.): 05.05.2023 – (12 ex.); 04.06.2023 – (1 ex.).

čeľaď Ohniváčikovité (Lycaenidae) – 18 spp. (1 028 ex.):
***Lycaena phleas* (Linnaeus, 1761) – 8 ex.:** Šandal (1 ex.): 10.07.2020 – (1 ex.); Kručov (1 ex.): 10.09.2020 – (1 ex.); Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Potôčky (4 ex.): 02.09.2023 – (4 ex.); Veľkrop (1 ex.): 01.09.2023 – (1 ex.).

***Lycaena dispar* (Haworth,1802) – 23 ex.:** Šandal (1 ex.): 26.07.2019 – (1 ex.); Ondavka (2 ex.): 07.07.2022 – (1 ex.); 27.08.2022 – (1 ex.); Vyšná Olšava (6 ex.): 10.06.2022 – (5 ex.); 08.07.2022 – (1 ex.); Potôčky (5 ex.): 06.07.2023 – (2 ex.); 02.09.2023 – (3 ex.); Veľkrop (9 ex.): 04.06.2023 – (1 ex.); 01.09.2023 – (8 ex.).

***Lycaena virgaureae* (Linnaeus, 1758) – 65 ex.:** Šandal (16 ex.): 26.07.2019 – (1 ex.); 10.07.2020 – (14 ex.); 14.08.2020 – (1 ex.); Kručov (8 ex.): 09.07.2020 – (7 ex.); 10.09.2020 – (1 ex.); Ondavka (18 ex.): 07.07.2022 – (12 ex.); 27.08.2022 – (6 ex.); Potôčky (17 ex.): 06.07.2023 – (6 ex.); 03.08.2023 – (8 ex.); 02.09.2023 – (3 ex.); Veľkrop (6 ex.): 05.07.2023 – (4 ex.); 01.09.2023 – (2 ex.).

***Lycaena tityrus* (Poda, 1761) – 20 ex.:** Šandal (7 ex.): 26.07.2019 – (5 ex.); 14.08.2020 – (2 ex.); Kručov (8 ex.): 26.07.2019 – (3 ex.); 09.07.2020 – (1 ex.); 13.08.2020 – (2 ex.); 10.09.2020 – (2 ex.); Ondavka (2 ex.): 09.06.2022 – (1 ex.); 07.07.2022 – (1 ex.); Vyšná Olšava (1 ex.): 10.06.2022 – (1 ex.); Potôčky (1 ex.): 03.08.2023 – (1 ex.); Veľkrop (1 ex.): 04.06.2023 – (1 ex.).

***Lycaena hippothoe* (Linnaeus, 1761) – 14 ex.:** Vyšná Olšava (2 ex.): 10.06.2022 – (2 ex.); Ondavka (11 ex.): 09.06.2022 – (11 ex.); Veľkrop (1 ex.): 04.06.2023 – (1 ex.).

***Satyrium pruni* (Linnaeus, 1758) – 1 ex.:** Vyšná Olšava (1 ex.): 10.06.2022 – (1 ex.).

***Satyrium acaciae* (Fabricius, 1787) – 18 ex.:** Potôčky (9 ex.): 06.07.2023 – (9 ex.); Veľkrop (9 ex.): 05.07.2023 – (9 ex.).

***Cupido minimus* (Fuessly, 1775) – 2 ex.:** Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Potôčky (1 ex.): 06.07.2023 – (1 ex.).

***Cupido argiades* (Pallas, 1771) – 95 ex.:** Šandal (29 ex.): 10.07.2020 – (6 ex.); 14.08.2020 – (22 ex.); 08.09.2020 – (1 ex.); Kručov (13 ex.): 26.07.2019 – (1 ex.); 09.07.2020 – (2 ex.); 13.08.2020 – (10 ex.); Ondavka (12 ex.): 07.07.2022 – (5 ex.); 27.08.2022 – (7 ex.); Vyšná Olšava (6 ex.): 26.08.2022 – (6 ex.); Potôčky (13 ex.): 06.05.2023 – (4 ex.); 06.07.2023 – (2 ex.); 03.08.2023 – (5 ex.); 02.09.2023 – (2 ex.); Veľkrop (22 ex.): 05.05.2023 – (3 ex.); 05.07.2023 – (15 ex.); 01.09.2023 – (4 ex.).

***Cupido decolorata* (Staudinger, 1886) – 15 ex.:** Šandal (3 ex.): 26.07.2019 – (3 ex.); Kručov (2 ex.): 26.07.2019 – (2 ex.); Ondavka (3 ex.): 09.06.2022 – (2 ex.); 07.07.2022 – (1 ex.); Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Veľkrop (6 ex.): 04.06.2023 – (6 ex.).

***Celastrina argiolus* (Linnaeus, 1758) – 6 ex.:** Šandal (1 ex.): 14.08.2020 – (1 ex.); Kručov (3 ex.): 26.07.2019 – (1 ex.); 09.07.2020 – (2 ex.); Veľkrop (2 ex.): 05.07.2023 – (2 ex.).

***Pseudophilotes vicrama* (Moore, 1865) – 6 ex.:** Vyšná Olšava (6 ex.): 08.07.2022 – (6 ex.).

***Phengaris arion* (Linnaeus, 1758) – 5 ex.:** Šandal (4 ex.): 10.07.2020 – (4 ex.); Kručov (1 ex.): 26.07.2019 – (1 ex.).

***Plebejus argus* (Linnaeus, 1758) – 502 ex.:** Šandal (21 ex.): 26.07.2019 – (11 ex.); 10.07.2020 – (4 ex.); 14.08.2020 – (6 ex.); Kručov (8 ex.): 26.07.2019 – (7 ex.); 13.08.2020 – (1 ex.); Ondavka (1 ex.): 27.08.2022 – (1 ex.); Vyšná Olšava (42 ex.): 10.06.2022 – (35 ex.); 08.07.2022 – (7 ex.); Potôčky (230 ex.): 03.06.2023 – (170 ex.); 03.08.2023 – (60 ex.); Veľkrop (200 ex.): 04.06.2023 – (200 ex.).

***Plebejus argyrognomon* (Bergsträsser, 1779) – 2 ex.:** Kručov (2 ex.): 26.07.2019 – (1 ex.); 13.08.2020 – (1 ex.).

***Aricia agestis* (Denis & Schiffermüller, 1775) – 2 ex.:** Kručov (2ex.): 10.09.2020 – (2 ex.).

***Cyaniris semiargus* (Rottemburg 1775) – 8 ex.:** Šandal (1 ex.): 10.07.2020 – (1 ex.); Ondavka (2 ex.): 09.06.2022 – (2 ex.); Vyšná Olšava (5 ex.): 10.06.2022 – (5 ex.).

***Polyommatus icarus* (Rottemburg 1775) – 236 ex.:** Šandal (22 ex.): 26.07.2019 – (8 ex.); 10.07.2020 – (1 ex.); 14.08.2020 – (10 ex.); 08.09.2020 – (3 ex.); Kručov (15 ex.): 26.07.2019 – (7 ex.); 13.08.2020 – (6 ex.); 10.09.2020 – (2 ex.); Ondavka (76 ex.): 09.06.2022 – (8 ex.); 07.07.2022 – (3 ex.); 27.08.2022 – (65 ex.); Vyšná Olšava (74 ex.): 10.06.2022 – (40 ex.); 08.07.2022 – (7 ex.); 26.08.2022 – (26 ex.); 07.10.2022 – (1 ex.); Potôčky (32 ex.): 03.06.2023 – (4 ex.); 06.07.2023 – (3 ex.); 03.08.2023 – (10 ex.); 02.09.2023 – (14 ex.); 06.10.2023 – (1 ex.); Veľkrop (17 ex.): 04.06.2023 – (2 ex.); 05.07.2023 – (4 ex.); 01.09.2023 – (10 ex.); 06.10.2023 – (1 ex).

čeľaď Babôčkovité (Nymphalidae) – 32 spp. (2 069 ex.):
***Pararge aegeria* (Linnaeus, 1758) –3 ex.:** Potôčky (1 ex.): 03.08.2023 – (1 ex.); Veľkrop (2 ex.): 05.05.2023 – (1 ex.); 04.06.2023 – (1 ex.).

***Coenonympha pamphilus* (Linnaeus, 1758) – 249 ex.:** Šandal (51 ex.): 26.07.2019 – (12 ex.); 10.07.2020 – (1 ex.); 14.08.2020 – (26 ex.); 08.09.2020 – (12 ex.); Kručov (24 ex.): 26.07.2019 – (11 ex.); 09.07.2020 – (2 ex.); 13.08.2020 – (8 ex.); 10.09.2020 – (3 ex.); Ondavka (21 ex.): 09.06.2022 – (8 ex.); 07.07.2022 – (1 ex.); 27.08.2022 – (12 ex.); Vyšná Olšava (76 ex.): 10.06.2022 – (45 ex.); 08.07.2022 – (2 ex.); 26.08.2022 – (29 ex.); Potôčky (32 ex.): 03.06.2023 – (12 ex.); 06.07.2023 – (1 ex.); 03.08.2023 – (6 ex.); 02.09.2023 – (13 ex.); Veľkrop (45 ex.): 04.06.2023 – (21 ex.); 05.07.2023 – (3 ex.); 01.09.2023 – (21 ex.).

***Coenonympha glycerion* (Borkhausen, 1788) – 70 ex.:** Šandal (13 ex.): 14.08.2020 – (8 ex.); 08.09.2020 – (5 ex.); Kručov (16 ex.): 26.07.2019 – (1 ex.); 13.08.2020 – (15 ex.); Ondavka (2 ex.): 07.07.2022 – (1 ex.); 27.08.2022 – (1 ex.); Vyšná Olšava (24 ex.): 10.06.2022 – (13 ex.); 26.08.2022 – (11 ex.); Potôčky (9 ex.): 03.06.2023 – (9 ex.); Veľkrop (6 ex.): 04.06.2023 – (4 ex.); 01.09.2023 – (2 ex.).

***Erebia aethiops* (Esper, 1777) – 3 ex.:** Potôčky (3 ex.): 03.08.2023 – (3 ex.).

***Erebia medusa* (Denis & Schiffermüller, 1775) – 21 ex.:** Ondavka (9 ex.): 09.06.2022 – (9 ex.); Vyšná Olšava (2 ex.): 10.06.2022 – (2 ex.); Potôčky (4 ex.): 03.06.2023 – (4 ex.); Veľkrop (6 ex.): 04.06.2023 – (6 ex.).

***Aphantopus hyperanthus* (Linnaeus, 1758) – 212 ex.:** Šandal (23 ex.): 26.07.2019 – (10 ex.); 10.07.2020 – (13 ex.); Kručov (11 ex.): 26.07.2019 – (5 ex.); 09.07.2020 – (5 ex.); 13.08.2020 – (1 ex.); Ondavka (105 ex.): 07.07.2022 – (105 ex.); Vyšná Olšava (70 ex.): 08.07.2022 – (70 ex.); Potôčky (3 ex.): 06.07.2023 – (1 ex.); 03.08.2023 – (2 ex.).

***Maniola jurtina* (Linnaeus, 1758) – 642 ex.:** Šandal (127 ex.): 26.07.2019 – (40 ex.); 10.07.2020 – (35 ex.); 14.08.2020 – (50 ex.); 08.09.2020 – (2 ex.); Kručov (154 ex.): 26.07.2019 – (20 ex.); 09.07.2020 – (70 ex.); 13.08.2020 – (60 ex.); 10.09.2020 – (4 ex.); Ondavka (83 ex.): 07.07.2022 – (70 ex.); 27.08.2022 – (13 ex.); Vyšná Olšava (140 ex.): 10.06.2022 – (40 ex.); 08.07.2022 – (70 ex.); 26.08.2022 – (30 ex.); Potôčky (110 ex.): 06.07.2023 – (65 ex.); 03.08.2023 – (33 ex.); 02.09.2023 – (12 ex.); Veľkrop (28 ex.): 05.07.2023 – (25 ex.); 01.09.2023 – (3 ex.).

***Melanargia galathea* (Linnaeus, 1758) – 92 ex.:** Šandal (16 ex.): 26.07.2019 – (3 ex.); 10.07.2020 – (13 ex.); Kručov (16 ex.): 09.07.2020 – (15 ex.); 13.08.2020 – (1 ex.); Ondavka (7 ex.): 07.07.2022 – (7 ex.); Vyšná Olšava (50 ex.): 08.07.2022 – (50 ex.); Potôčky (1 ex.): 06.07.2023 – (1 ex.); Veľkrop (2 ex.): 05.07.2023 – (2 ex.).

***Minois dryas* (Scopoli, 1763) – 33 ex.:** Šandal (24 ex.): 26.07.2019 – (21 ex.); 14.08.2020 – (3 ex.); Kručov (3 ex.): 13.08.2020 – (3 ex.); Potôčky (6 ex.): 03.08.2023 – (6 ex.).

***Brintesia circe* (Fabricius, 1775) – 1 ex.:** Kručov (1 ex.): 13.08.2020 – (1 ex.).

***Argynnis paphia* (Linnaeus, 1758) – 82 ex.:** Šandal (29 ex.): 26.07.2019 – (19 ex.); 10.07.2020 – (1 ex.); 14.08.2020 – (9 ex.); Kručov (47 ex.): 26.07.2019 – (4 ex.); 09.07.2020 – (4 ex.); 13.08.2020 – (30 ex.); 10.09.2020 – (9 ex.); Ondavka (3 ex.): 27.08.2022 – (3 ex.); Vyšná Olšava (2 ex.): 26.08.2022 – (2 ex.); Potôčky (1 ex.): 03.08.2023 – (1 ex.).

***Speyeria aglaja* (Linnaeus, 1758) – 33 ex.:** Šandal (28 ex.): 10.07.2020 – (27 ex.); 14.08.2020 – (1 ex.); Kručov (2 ex.): 13.08.2020 – (2 ex.); Ondavka (2 ex.): 07.07.2022 – (2 ex.); Potôčky (1 ex.): 03.08.2023 – (1 ex.).

***Fabriciana adippe* (Denis & Schiffermüller, 1775) – 50 ex.:** Šandal (24 ex.): 10.07.2020 – (16 ex.); 14.08.2020 – (6 ex.); 08.09.2020 – (2 ex.); Kručov (6 ex.): 09.07.2020 – (2 ex.); 13.08.2020 – (4 ex.); Ondavka (7 ex.): 27.08.2022 – (7 ex.); Vyšná Olšava (2 ex.): 26.08.2022 – (2 ex.); Potôčky (4 ex.): 06.07.2023 – (1 ex.); 03.08.2023 – (1 ex.); 02.09.2023 – (2 ex.); Veľkrop (7 ex.): 05.07.2023 – (2 ex.); 01.09.2023 – (5 ex.).

***Fabriciana laodice* (Pallas, 1771) – 5 ex.:** Šandal (5 ex.): 10.07.2020 – (2 ex.); 14.08.2020 – (3 ex.).

***Issoria lathonia* (Linnaeus, 1758) – 1 ex.:** Vyšná Olšava (1 ex.): 26.08.2022 – (1 ex.).

***Brenthis ino* (Rottemburg, 1775) – 6 ex.:** Ondavka (6 ex.): 07.07.2022 – (6 ex.).

***Brenthis daphne* (Denis & Schiffermüller, 1775) – 14 ex.:** Šandal (2 ex.): 10.07.2020 – (2 ex.); Kručov (1 ex.): 09.07.2020 – (1 ex.); Ondavka (4 ex.): 07.07.2022 – (4 ex.); Vyšná Olšava (4 ex.): 10.06.2022 – (1 ex.); 08.07.2022 – (3 ex.); Potôčky (3 ex.): 06.07.2023 – (3 ex.).

***Boloria selene* (Denis & Schiffermüller, 1775) – 53 ex.:** Šandal (19 ex.): 26.07.2019 – (7 ex.); 14.08.2020 – (10 ex.); 08.09.2020 – (2 ex.); Kručov (7 ex.): 26.07.2019 – (4 ex.); 13.08.2020 – (2 ex.); 10.09.2020 – (1 ex.); Ondavka (20 ex.): 09.06.2022 – (15 ex.); 07.07.2022 – (1 ex.); 27.08.2022 – (4 ex.); Vyšná Olšava (2 ex.): 10.06.2022 – (2 ex.); Potôčky (3 ex.): 03.06.2023 – (1 ex.); 03.08.2023 – (2 ex.); Veľkrop (2 ex.): 04.06.2023 – (2 ex.).

***Boloria dia* (Linnaeus, 1767) – 7 ex.:** Kručov (1 ex.): 09.07.2020 – (1 ex.); Ondavka (1 ex.): 07.07.2022 – (1 ex.); Potôčky (5 ex.): 02.09.2023 – (5 ex.).

***Apatura ilia* (Denis & Schiffermüller, 1775) – 6 ex.:** Šandal (1 ex.): 26.07.2019 – (1 ex.); Kručov (4 ex.): 09.07.2020 – (3 ex.); 13.08.2020 – (1 ex.); Ondavka (1 ex.): 07.07.2022 – (1 ex.).

***Apatura iris* (Linnaeus, 1758) – 1 ex.:** Veľkrop (1 ex.): 05.07.2023 – (1 ex.).

***Nymphalis antiopa* (Linnaeus, 1758) – 2 ex.:** Vyšná Olšava (1 ex.): 08.07.2022 – (1 ex.); Veľkrop (1 ex.): 05.05.2023 – (1 ex.).

***Nymphalis polychloros* (Linnaeus, 1758) – 1 ex.:** Veľkrop (1 ex.): 05.05.2023 – (1 ex.).

***Aglais urticae* (Linnaeus, 1758) – 9 ex.:** Ondavka (5 ex.): 06.05.2022 – (1 ex.); 09.06.2022 – (4 ex.); Vyšná Olšava (2 ex.): 10.06.2022 – (2 ex.); Potôčky (1 ex.): 06.07.2023 – (1 ex.); Veľkrop (1 ex.): 06.10.2023 – (1 ex.).

***Aglais io* (Linnaeus, 1758) – 48 ex.:** Šandal (5 ex.): 26.07.2019 – (1 ex.); 08.09.2020 – (4 ex.); Kručov (31 ex.): 09.07.2020 – (2 ex.); 10.09.2020 – (29 ex.); Ondavka (5 ex.): 07.07.2022 – (5 ex.); Potôčky (5 ex.): 03.06.2023 – (1 ex.); 02.09.2023 – (4 ex.); Veľkrop (2 ex.): 05.05.2023 – (2 ex.).

***Vanessa atalanta* (Linnaeus, 1758) – 28 ex.:** Šandal (4 ex.): 26.07.2019 – (2 ex.); 14.08.2020 – (1 ex.); 08.09.2020 – (1 ex.); Kručov (2 ex.): 09.07.2020 – (1 ex.); 13.08.2020 – (1 ex.); Ondavka (4 ex.): 07.07.2022 – (2 ex.); 27.08.2022 – (2 ex.); Vyšná Olšava (7 ex.): 26.08.2022 – (3 ex.); 07.10.2022 – (4 ex.); Potôčky (8 ex.): 06.05.2023 – (1 ex.); 06.07.2023 – (1 ex.); 03.08.2023 – (1 ex.); 02.09.2023 – (4 ex.); 06.10.2023 – (1 ex.); Veľkrop (3 ex.): 05.07.2023 – (2 ex.); 01.09.2023 – (1 ex.).

***Vanessa cardui* (Linnaeus, 1758) – 20 ex.:** Šandal (6 ex.): 26.07.2019 – (6 ex.); Kručov (2 ex.): 26.07.2019 – (1 ex.); 13.08.2020 – (1 ex.); Ondavka (10 ex.): 09.06.2022 – (7 ex.); 07.07.2022 – (3 ex.); Vyšná Olšava (2 ex.): 10.06.2022 – (2 ex.).

***Polygonia c-album* (Linnaeus, 1758) – 19 ex.:** Šandal (2 ex.): 26.07.2019 – (1 ex.); 08.09.2020 – (1 ex.); Kručov (6 ex.): 26.07.2019 – (1 ex.); 09.07.2020 – (2 ex.); 13.08.2020 – (3 ex.); Ondavka (2 ex.): 06.05.2022 – (1 ex.); 07.07.2022 – (1 ex.); Vyšná Olšava (4 ex.): 08.07.2022 – (1 ex.); 26.08.2022 – (1 ex.); 07.10.2022 – (2 ex.); Potôčky (3 ex.): 06.05.2023 – (1 ex.); 03.08.2023 – (1 ex.); 02.09.2023 – (1 ex.); Veľkrop (2 ex.): 05.07.2023 – (2 ex.).

***Araschnia levana* (Linnaeus, 1758) – 171 ex.:** Šandal (20 ex.): 10.07.2020 – (2 ex.); 14.08.2020 – (18 ex.); Kručov (51 ex.): 09.07.2020 – (10 ex.); 13.08.2020 – (40 ex.); 10.09.2020 – (1 ex.); Ondavka (21 ex.): 06.05.2022 – (8 ex.); 09.06.2022 – (1 ex.); 07.07.2022 – (12 ex.); Vyšná Olšava (9 ex.): 08.07.2022 – (8 ex.); 26.08.2022 – (1 ex.); Potôčky (37 ex.): 06.05.2023 – (16 ex.); 03.06.2023 – (1 ex.); 06.07.2023 – (5 ex.); 03.08.2023 – (3 ex.); 02.09.2023 – (11 ex.); 06.10.2023 – (1 ex.); Veľkrop (33 ex.): 05.05.2023 – (12 ex.); 04.06.2023 – (1 ex.); 05.07.2023 – (7 ex.); 01.09.2023 – (13 ex.).

***Melitaea diamina* (Lang, 1789) – 6 ex.:** Ondavka (1 ex.): 09.06.2022 – (1 ex.); Potôčky (1 ex.): 06.07.2023 – (1 ex.); Veľkrop (4 ex.): 05.07.2023 – (4 ex.).

***Melitaea phoebe* (Denis & Schiffermüller, 1775) – 4 ex.:** Šandal (2 ex.): 14.08.2020 – (2 ex.); Kručov (1 ex.): 13.08.2020 – (1 ex.); Veľkrop (1 ex.): 04.06.2023 – (1 ex.).

***Melitaea athalia* (Rottemburg, 1775) – 172 ex.:** Šandal (94 ex.): 26.07.2019 – (9 ex.); 14.08.2020 – (80 ex.); 08.09.2020 – (5 ex.); Kručov (52 ex.): 26.07.2019 – (9 ex.); 13.08.2020 – (40 ex.); 10.09.2020 – (3 ex.); Ondavka (2 ex.): 09.06.2022 – (2 ex.); Vyšná Olšava (11 ex.): 10.06.2022 – (10 ex.); 26.08.2022 – (1 ex.); Potôčky (4 ex.): 03.06.2023 – (3 ex.); 03.08.2023 – (1 ex.); Veľkrop (9 ex.): 04.06.2023 – (8 ex.); 05.07.2023 – (1 ex.).

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Original paper

Moth flies (Diptera, Psychodidae) of Broumovsko PLA and neighbouring areas, Czech Republic

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Abstract
The biodiversity of non-biting moth flies (Diptera, Psychodidae) from the area of Broumovsko PLA and neighboring environs is presented. A total of 48 species are recorded. Five species are critically endangered: *Peripsychoda fusca* (Macquart, 1826); *Clytocerus* (*Boreoclytocerus*) *rivosus* (Tonnoir, 1919); *Saraiella rotunda* (Krek, 1970); *Szaboiella hibernica* (Tonnoir, 1940); *Tonnoiriella nigricauda* (Tonnoir, 1919). Three species are endangered: *Threticus incurvus* Krek, 1972; *Pneumia cubitospinosa* (Jung, 1954); *P. vittata* (Tonnoir, 1919). One species is vulnerable: *Threticus silvaticus* Ježek, 1985. Moreover, one species is nationally scarce: *Berdeniella vimmeri* Ježek, 1995. A basic prerequisite for the understanding and protection of biodiversity is the building of a high-quality faunal and taxonomic base. This knowledge can be applied to the protection of endangered species (10 in this account), as well as the management of their habitats.

Keywords: Psychodinae, biodiversity, faunistics, distribution, zoogeography, threatened species, conservation potential, Bohemia, Europe, Palaearctic Region.

Introduction

The family Psychodidae (Figure 1) (Diptera, Nematocera) has more than 3000 described species (Pape et al. 2011) in the world. Moth flies are holometabolic insects whose life cycle takes place in aquatic, semiaquatic, or terrestrial ecosystems. Larvae develop in a variety of microhabitats, ranging from standing or flowing freshwater (water reservoirs, brooks, waterfalls, and spring areas) or sewage to moist soil near tree roots, rotting tree trunks, and domestic microhabitats such as bathroom and kitchen drains. Adults tend to rest in protected and relatively moist microhabitats, such as under the bark and in tree holes, on the underside of leaves, in rock crevices, burrows, stables, caves, and on the inside walls of buildings, e.g. Szabó (1983) and Withers (1989).

Figure 1. Psychodidae – adult. Photo by František Mucha.

This work represents a continuation of a series of works, e.g. Ježek & Hájek (2007), Ježek et al. (2008, 2014, 2019, 2021, 2024a,b,c), Kroča & Ježek (2015, 2019, 2022), Ježek & Omelková (2012) which describe and summarize the biodiversity of the moth flies (Diptera: Psychodidae) in selected regions of the Czech Republic.

The area of Broumovsko is included in the Hradec Králové region as a conspicuous tongue NW bulge. It was designated as a Protected Landscape Area in 1991 and has 430 km^2. There´s a great variety of natural elements in this hilly area from 355 to 880 m a.s.l., which make homogenous nature complex: fragments of original plant communities, beech woods, sandy rocks, rocky towns, coal and ore mines, dumps, sludge water defecation and sedimentation, slope meadows, pastures, fountains, brooks, ponds, and swamps (11 small natural reserves of different degrees of endangerment). The landscape is in the south, demarcated sensu lato by the settlements Radvanice, Malé Svatoňovice, Rtyně v Podkrkonoší, Hronov, and Žďárky – the northern part is limited by the waved frontier of Poland. The general natural history of the whole studied area was characterized, e.g., briefly by Vítek (2000). Many interesting current details were added by David & Soukup (2003).

Generally, dipterists have not visited the area of Broumovsko in the past to collect moth flies, and almost nothing has thus far been published: from the frontier only *Tinearia lativentris* (Berdén, 1952) – Meziměstí (Ježek 1977). New records in the years 1997–1998 are represented by five species: *Peripsychoda fusca* (Macquart, 1826) – Křinice and Šonov (Ježek 2003); *Threticus incurvus* Krek, 1972 – Dolní Adršpach and Adršpach – Spálený Mlýn (Ježek 2003);

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Berdeniella stavniensis (Krek, 1969) – Petříkovice (Ježek 2003); *Pneumia cubitospinosa* (Jung, 1954) – Božanov, Koruna hill (Ježek 2003); *Szaboiella hibernica* (Tonnoir, 1940) – Šonov (Ježek 2004a).

Our study aim is to present published new and unpublished faunal data with the contribution of biodiversity research on moth flies (Diptera: Psychodidae) of Broumovsko PLA and neighboring areas (Czech Republic).

Material and methods

This study is based on 257 slides of moth flies. The material was collected in the area of Broumovsko PLA (with neighboring not preserved territory and adjacent localities) between 1997 – 1999. A prime mover of the biodiversity research project was the cooperation between the administration of the management and the Department of Entomology of the National Museum, Prague. Our material was recorded only by sweep netting (by the first author, and sometimes by Pavel Chvojka – NM Praha) during individual excursions. The name of the collector is always mentioned in the text. The captured moth flies were preserved in 70 % ethanol in the field and subsequently cleared in chloralphenol, treated in xylol, determined by the first author and mounted on glass slides in Canada balsam. The voucher specimens are deposited in the National Museum, Prague, Czech Republic (NMPC). Slides were numbered in the NMPC by INS = Inventory Slide Number of the family Psychodidae (see Tkoč et al. 2014). Most of the recent data comes from a total of 43 localities; see the numbered list of collecting sites prepared in correspondence with the map used: Broumovsko, Góry Kamienne a Stołove, Edice klubu českých turistů (26) 1: 50 000, Trasa, 2018. Coordinates: the places of sweeping are often not quite precise. Detailed information's were included and supplied with the codes of fields in the faunistic and floristic grid mapping system for Central Europe (Ehrendorfer & Hamann 1965; Zelený 1972; Pruner & Míka 1996).

Identification keys used: Vaillant (1971 – 1983), Szabó (1983), Withers (1989) and numerous unnamed original papers by different authors with descriptions of new species. The nomenclature is modified sensu Vaillant (1971 – 1983) and Wagner (1990, 2023) using the classifications of e.g. Ježek & van Harten (2005, 2009), Ježek (2007), Ježek et al. (2018, 2020, 2021, 2023b), Omelková & Ježek (2012a,b,c), Oboňa & Ježek (2014), Kvifte (2014) and Kroča & Ježek (2015, 2019, 2022).

Abbreviations used:

♂ = male; ♀ = female; SW = sweeping; C = Chvojka leg.; J = Ježek; PLA = Chráněná krajinná oblast (Protected Landscape Area); NNR = National nature reserve; AOPK = Agentura ochrany přírody a krajiny (Administration of nature and landscape protection); ATS = Adršpašsko–teplické skály rocks; Threatened species: CR = critically endangered, EN = endangered, VU = vulnerable, NS = species not assessed in the Czech Red List (Ježek 2005).

List of all collecting areas

(See Figures 2 – 17)

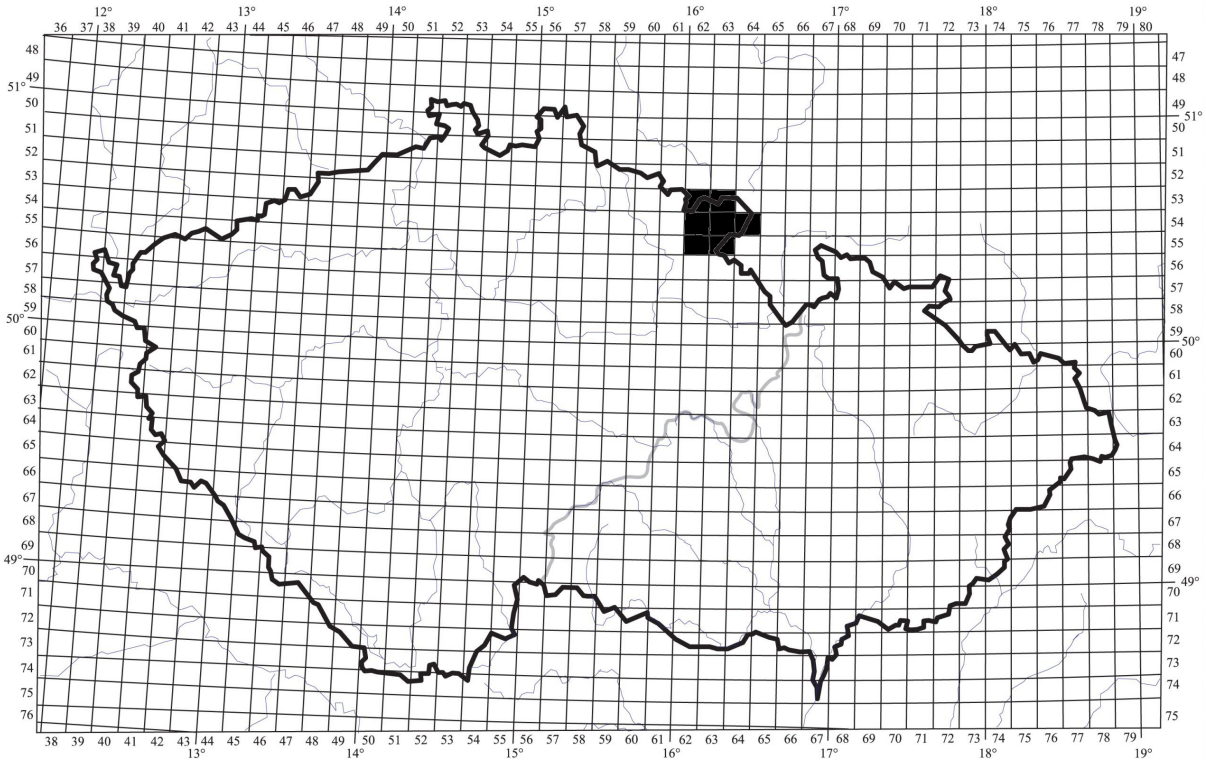

Figure 2. Map of faunistic squares in the Czech Republic. Created by Jozef Oboňa.

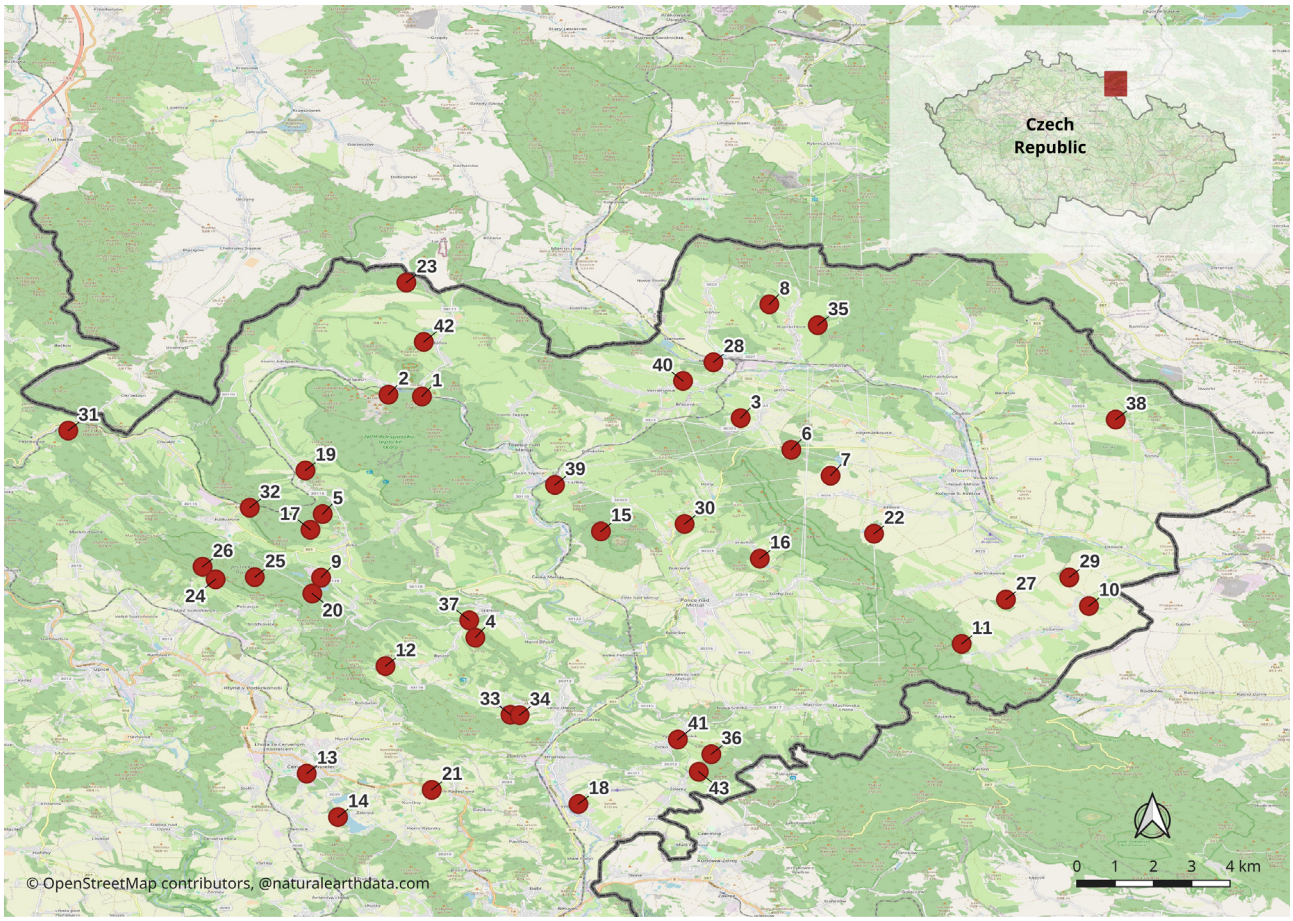

Figure 3. Map of the study area with sites 1 – 43. Prepared by Jana Michalková.

1. Adršpach – Spálený Mlýn, forest edge, slope spring area, small brooks, muddy pool, Broumovsko PLA, 496 m a.s.l., 5362, 50°36'N 16°07'E. Veg.: *Picea, Sorbus, Petasites,* Pteropsida.

2. Dolní Adršpach, Metuje river near railway station, sandy rocks, Broumovsko PLA, 527 m a.s.l., 5362, 50°36'N 16°07'E. Veg.: *Rhododendron, Frangula, Alnus, Acer,* Pteropsida, *Petasites, Aegopodium,* Daucaceae.

3. Between Březová and Jetřichov, Mokřadní louky meadows, swamps, Broumovsko PLA, 482 m a.s.l., 5363, 50°36'N 16°15'E. Veg.: *Picea, Sorbus, Alnus, Caltha, Filipendula, Nasturtium, Carex,* Pteropsida.

4. Between Bystré and Stárkov, swamps near a crossroad, small brook, Broumovsko PLA, 438 m a.s.l., 5462, 50°31'N 16°09'E. Veg.: *Salix, Populus, Betula, Picea, Rubus, Urtica, Aegopodium, Senecio,* Musci, Daucaceae.

5. Between Janovice and Horní Vernéřovice, Dřevíč brook, rapids, alluvium, Broumovsko PLA, 508 m a.s.l., 5462, 50°34'N 16°05'E. Veg.: *Alnus, Senecio, Filipendula, Scirpus, Petasites*.

6. Between Křinice and Hejtmánkovice, Lesní školky forest nursery, small pond, Broumovsko PLA, 471 m a.s.l., 5363, 50°35'N 16°16'E. Veg.: *Alnus, Betula, Sorbus, Salix, Rubus, Caltha, Filipendula, Nasturtium, Equisetum,* Poaceae.

7. Between Křinice and Hejtmánkovice, Šlégr pond, marshy area, Broumovsko PLA, 435 m a.s.l., 5363, 50°35'N 16°17'E. Veg.: *Alnus, Caltha, Equisetum, Nasturtium, Urtica, Filipendula, Myosotis.*

8. Between Pomeznice and Ruprechtice, pasture, spring area, small brook, Broumovsko PLA, 454 m a.s.l., 5363, 50°38'N 16°15'E. Veg.: *Picea, Frangula, Betula, Corylus, Cerasus, Rosa, Scirpus, Glyceria, Asarum, Filipendula, Myosotis, Calamagrostis.*

9. Bohumír cupriferous mine near Dolní Vernéřovice, pond, Broumovsko PLA, 490 m a.s.l., 5462, 50°32'N 16°05'E. Veg.: *Alnus, Betula, Picea, Leonurus, Mentha, Lysimachia,* Poaceae.

10. Božanov – Na končinách, Božanovský potok brook, Broumovsko PLA, 358 m a.s.l., 5464, 50°32'N 16°22'E. Veg.: *Fraxinus, Tilia, Alnus, Pyrus, Sambucus, Urtica, Impatiens, Geum,* Daucaceae.

11. Božanov, Koruna hill, 769.3 m a.s.l., slope, rill, Broumovsko PLA, 451 m a.s.l., 5463, 50°31'N 16°19'E. Veg.: *Fagus, Betula, Rubus,* Pteropsida, *Fragaria,* Lamiaceae.

12. Chlívce env. Rtyně v Podkrkonoší, settlement brook, pastures, Broumovsko PLA, 357 m a.s.l., 5462, 50°30'N 16°07'E. Veg.: *Betula, Salix, Sambucus, Rubus, Urtica, Senecio, Sanguisorba,* Daucaceae.

13. Červený Kostelec, Čermák pond, 412 m a.s.l., 5562, 50°28'N 16°05'E. Veg.: *Populus, Alnus, Phragmites, Filipendula, Lythrum, Impatiens, Caltha, Alisma, Cirsium,* Daucaceae.

14. Červený Kostelec, Špinka pond, black mud, flocculated Fe, 421 m a.s.l., 5562, 50°27'N 16°06'E. Veg.: *Alnus, Picea, Sorbus, Ribes, Rubus, Phragmites, Caltha, Impatiens, Urtica, Scirpus,* Pteropsida.

15. Dědov near Teplice nad Metují, Klučanka brook, spring area, Broumovsko PLA, 528 m a.s.l., 5463, 50°33'N 16°11'E. Veg.: *Picea* – forest, *Alnus, Rubus, Filipendula, Equisetum, Scirpus, Caltha, Mentha, Urtica,* Lamiaceae, Musci.

16. Hlavňov near Police nad Metují, mill, ponds, swamps, Broumovsko PLA, 515 m a.s.l., 5463, 50°33'N 16°15'E. Veg.: *Populus, Alnus, Salix, Betula, Picea, Juncus, Carduus, Filipendula.*

17. Horní Vernéřovice, Jívka brook, valley, Broumovsko PLA, 510 m a.s.l., 5462, 50°33'N 16°05'E. Veg.: *Picea* – forest, *Alnus, Rubus, Impatiens, Caltha, Oxalis,* Pteropsida, *Equisetum,* Musci, Marchantiopsida.

18. Hronov – Velké Poříčí, Homolka hill, 387.9 m a.s.l., pond, outflow, 363 m a.s.l., 5563, 50°27'N 16°11'E. Veg.: *Alnus, Salix, Betula, Rubus, Urtica, Filipendula, Aegopodium, Phragmites.*

19. Janovice env. Adršpach, swamps, brook, Broumovsko PLA, 555 m a.s.l., 5462, 50°35'N 16°05'E. Veg.: *Alnus, Betula, Sambucus, Salix, Petasites, Filipendula, Urtica, Calamagrostis,* Daucaceae.

20. Jívka env. Teplice nad Metují, pastures, swamps, ponds, Broumovsko PLA, 502 m a.s.l., 5462, 50°32'N 16°05'E. Veg.: *Salix, Alnus, Scirpus, Filipendula, Typha, Lysimachia, Urtica, Lemna, Symphytum,* Daucaceae.

21. Kostelecké Končiny env. Horní Radechová, small brook, 445 m a.s.l., 5562, 50°28'N 16°08'E. Veg.: *Picea* – forest, *Alnus, Betula, Sorbus, Sambucus, Impatiens, Caltha, Mentha, Carduus,* Daucaceae, *Urtica, Rubus.*

22. Křinice env. Broumov, Křinické rybníky ponds, Kočičí Mlýn, swamps, Broumovsko PLA, 429 m a.s.l., 5463, 50°33'N 16°17'E. Veg.: Alnetum, *Frangula, Rubus, Caltha, Nasturtium, Geum, Scirpus.*

23. Libná – Zdoňovský potok brook env. Adršpach, wet meadows, rills, Broumovsko PLA, 548 m a.s.l., 5362, 50°39'N 16°07'E. Veg.: *Picea* – forest, *Betula, Salix, Acer, Rubus, Stachys, Impatiens, Juncus, Glyceria, Urtica, Caltha, Senecio,* Pteropsida, Daucaceae, Musci.

24. Malé Svatoňovice – Panská cesta way, Kolčarka hill, 691.1 m a.s.l., muddy pool, forest, Broumovsko PLA, 697 m a.s.l., 5462, 50°32'N 16°03'E. Veg.: *Picea, Alnus, Sorbus, Impatiens,* Pteropsida, Musci.

25. Malé Svatoňovice, Volský důl, brook, marshes, flocculated Fe, Broumovsko PLA, 678 m a.s.l., 5462, 50°32'N 16°04'E. Veg.: *Picea* – forest, *Alnus, Petasites, Urtica, Equisetum,* Marchantiopsida, Poaceae.

26. Malé Svatoňovice, Žaltman hill, 739.1 m a.s.l., swamps, Broumovsko PLA, 692 m a.s.l., 5462, 50°32'N 16°03'E. Veg.: *Fagus* – forest, *Acer, Impatiens, Stachys, Asarum, Oxalis, Asperula, Urtica,* Pteropsida.

27. Martínkovice, Punarův rybník pond, fields, brook, swamps, Broumovsko PLA, 407 m a.s.l., 5464, 50°32'N 16°20'E. Veg.: *Populus, Alnus, Rubus, Frangula, Nasturtium, Scirpus, Lythrum, Urtica, Aegopodium.*

28. Meziměstí env. Broumov, forest edge, small brook, rubbish, Broumovsko PLA, 435 m a.s.l., 5363, 50°37'N 16°14'E. Veg.: *Picea, Alnus, Salix, Sambucus, Filipendula, Urtica, Stachys, Calamagrostis, Senecio.*

29. Otovice env. Broumov, Janečkova stráň slope, small pond, outflow, fields, Broumovsko PLA, 362 m a.s.l., 5464, 50°32'N 16°22'E. Veg.: *Salix, Populus, Picea, Betula, Sambucus, Frangula, Rubus, Calamagrostis, Urtica, Arctium, Epilobium*, Poaceae.

30. Pěkov near Police nad Metují, small brook, Broumovsko PLA, 500 m a.s.l., 5463, 50°33'N 16°13'E. Veg.: *Populus, Alnus, Salix, Sambucus, Urtica, Aegopodium, Carduus,* Pteropsida, *Calamagrostis,* Daucaceae.

31. Petříkovice env. Chvaleč, brook, 523 m a.s.l., 5361, 50°35'N 16°00'E. Veg.: *Picea* – forest, *Alnus, Betula, Sambucus, Acer, Petasites, Deschampsia, Impatiens, Urtica, Rosa, Oxalis,* Pteropsida, Musci.

32. Radvanice, meadows, small brook, swamps near the railway station, Broumovsko PLA, 557 m a.s.l., 5462, 50°34'N 16°04'E. Veg.: *Salix, Acer, Sorbus, Alnus, Filipendula, Glyceria, Equisetum, Mentha, Petasites, Scirpus, Urtica, Aegopodium,* Pteropsida, Daucaceae.

33. Rokytník env. Hronov, Křížová area 434.2 m a.s.l., pastures, swamps, Broumovsko PLA, 411 m a.s.l., 5462, 50°29'N 16°09'E. Veg.: *Acer, Urtica, Filipendula, Scirpus, Aegopodium.*

34. Rokytník env. Hronov, cowshed, small ponds, sheep´s walk, rubbish, Broumovsko PLA, 405 m a.s.l., 5462, 50°29'N 16°10'E. Veg.: *Salix, Typha, Equisetum, Urtica, Lemna, Geranium,* Daucaceae.

35. Ruprechtice, Ruprechtická mokřina swamps, forest edge, small brook, Broumovsko PLA, 454 m a.s.l., 5363, 50°38'N 16°16'E. Veg.: *Picea, Rubus, Phragmites, Lysimachia, Senecio,* Pteropsida.

36. Sedmákovice near Vysoká Srbská, Brlenka brook, fountain, spring area, Broumovsko PLA, 446 m a.s.l., 5563, 50°28'N 16°14'E. Veg.: *Picea* – forest, *Alnus, Ribes, Petasites, Impatiens,* Pteropsida.

37. Stárkov, Zámecký kopec hill, 491.8 m a.s.l., Jívka brook, rotten hay, Broumovsko PLA, 431 m a.s.l., 5462, 50°31'N 16°09'E. Veg.: *Acer, Alnus, Betula, Sambucus, Salix, Urtica, Senecio, Aegopodium,* Daucaceae.

38. Šonov env. Broumov, spring area, 530 m a.s.l., brook, Broumovsko PLA, 496 m a.s.l., 5464, 50°36'N 16°23'E.

39. Teplice nad Metují – railway station, polluted gutter, Broumovsko PLA, 496 m a.s.l., 5462, 50°34'N 16°10'E. Veg.: *Salix, Betula, Acer, Petasites* (2.5 m high), *Nasturtium, Urtica, Galium.*

40. Vernéřovice env. Meziměstí, Vernéřovická studánka fountain, church, rushes, swamps, flocculated Fe, Broumovsko PLA, 447 m a.s.l., 5363, 50°37'N 16°13'E. Veg.: Alnetum, *Caltha, Nasturtium, Senecio, Lysimachia, Scirpus.*

41. Vysoká Srbská env. Hronov, village pond, gardens, Broumovsko PLA, 485 m a.s.l., 5563, 50°29'N 16°13'E. Veg.: *Salix, Lythrum, Leonurus, Nymphaea, Lysimachia,* Daucaceae.
42. Zdoňov env. Meziměstí, meadows, pond, Broumovsko PLA, 530 m a.s.l., 5362, 50°37'N 16°08'E. Veg.: *Salix, Betula, Filipendula, Leonurus, Galium, Scirpus, Cirsium, Carduus,* Daucaceae.
43. Žďárky env. Hronov, forest, small pond, flocculated Fe, Broumovsko PLA, 433 m a.s.l., 5563, 50°28'N 16°14'E. Veg.: *Picea, Alnus, Salix, Filipendula, Scirpus, Lysimachia, Urtica, Nasturtium, Potamogeton, Glyceria.*

Figure 4. A rock town that was created after the retreat of the Cretaceous Sea due to tectonic movements, weathering processes, and water erosion in the original continuous sandstone sheet. Photo by Zuzana Růžičková.

Figure 5. The area of Adršpašsko-teplické skály rocks (NNR) is a geomorphologically extraordinary and remarkable zone covered with forest ecosystems: acidophile clusters of spruces, relict rocky pine woods, in lower elevation turf tree growths, and ephemeral peatmosses. Beech woods are rare. Photo by Zuzana Růžičková.

Figure 6. Řeřichova rokle ravine with rocky walls that often drip water, slope sources, and intermitten swamps is one of the narrow and deep wet valleys between Adršpašské skály rocks and Teplické skály rocks (NNR ATS). Photo by Zuzana Růžičková.

Figure 7. An interesting feature of the Broumovských steny walls are numerous rock mushrooms in the vicinity of settlement Slavne and Bozanovsky Spicak hill, as an example of the so-called selective weathering of sandstone rocks. Photo by Zuzana Růžičková.

Figure 8. A unique azure limpid lake in Adršpašské skály rocks is Pískovna (former quarry – now inundated by strong water sources), with clear water and white sandy shores. Photo by Zuzana Růžičková.

Figure 9. Adršpašský Malý vodopád, a small waterfall on the stream Metuje, falls from rocky gulchs et an elevation of approximately 4 m. Water spray drops Pteropsida, Marchantiopsida and Musci, and a wet rocky basis is covered with slime film of algae and bacteria – suitable habitat for the development of larvae of Psychodidae (fauna hygropetrica). Photo by Zuzana Růžičková.

Figure 10. Outflow of the Metuje River from the Pseudokarst Cave Pod Velkým vodopádem large waterfall (NNR ATS) with alluvial conspicuous herbs – habitat of many species of nematocerous flies. The water is colored by fulvoasids from peat sediments. Photo by Zuzana Růžičková.

Figure 11. The littoral zone of Černé jezírko lake, a small former pond above Manor Bischofstein, with stagnant water, is overgrown with *Carex*, *Juncus*, and in particular *Eriophorum* – habitat for the development of aquatic insects. Photo by Zuzana Růžičková.

Figure 12. The scarcest and most interesting psychodid species in swamps at the bottom of ravines and in neighborhoods of rocky towns are *Threticus incurvus* Krek, 1972 and *Saraiella rotunda* (Krek, 1970). Photo by Zuzana Růžičková.

Figure 13. Broumov basin is a culture landscape with villages, arable areas, small forests, and brooks that stream into the Stěnava rivulet. View from Křinice to Broumov, Javoří hory hills behind. Photo by Zuzana Růžičková.

Figure 14. Characteristic setting of wooded hills in combination with pastures and stripes of balk shrubs (Javoří hory hills, view from Heřmánkovice, Jelení vrch hill in foreground, autumn aspect). Photo by Zuzana Růžičková.

Figure 15. Arable land in SE margin of Broumov basin (view on upper part of Božanov with top of Koruna hill, the dominant of Broumovské stěny walls). Photo by Zuzana Růžičková.

Figure 16. Fruitful Broumov basin bordered SW by ridge line of Broumovské stěny walls (top Koruna to the left, view from small road near Šonov). Photo by Zuzana Růžičková.

Figure 17. Dark backdrops of ridges of Javoří hory hills in foggy haze with a combination of clouds of proceeding rain front during nightfall (view from Janovičky). Photo by Zuzana Růžičková.

Results and Discussion

Faunistics
Order Diptera
Family Psychodidae

Paramormiini
Paramormiina

***Jungiella* (*Jungiella*) *soleata* (Walker, 1856)**
Unpublished record: Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7324.
Comments. Species is distributed almost throughout Europe, including the British Islands. However, it is not recorded from Scandinavia or the Iberian Peninsula. Known as well from northern Iran. Detailed information is in Ježek et al. (2020).

***Panimerus notabilis* (Eaton, 1893)**
Unpublished records: Hronov – Velké Poříčí **(18),** ♂, 4.8.1998, J, INS 9157. Vysoká Srbská env. Hronov **(41)**, ♂, 31.7.1999, J, INS 9110.
Comments. Mainly European species, known from countries along the Northern Sea, incl. the British Isles, from the Scandinavian bioregion, Central Europe, Poland, and the Balkan, penetrate to northern Iran (Kandavan). The species has not been taken so far from the Iberian Peninsula and the European part of Russia (see Ježek et al. 2014, 2019).

***Parajungiella longicornis* (Tonnoir, 1919)**
Unpublished records: Between Křinice and Hejtmánkovice, Šlégl pond **(7)**, ♂, 22.5.1997, J, INS 7310. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7327.
Comments. European and West Siberian species, very common, occurring in 17 countries. Localities along the Northern Sea include the British Islands, Scandinavia, Central and South Europe, and the Novosibirsk region in Russia. Not recorded from the Iberian Peninsula so far. An overview of the detailed distribution is given, e.g., by Ježek (1992) and Ježek et al. (2014, 2020).

***Paramormia* (*Paramormia*) *polyascoidea* (Krek, 1971)**
Unpublished records: Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8116. Between Křinice and Hejtmánkovice, Šlégl pond **(7)**, ♂, 22.5.1997, J, INS 7312. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8068.
Comments. European and West Siberian species, known from 10 countries, penetrate into Transcaucasia (Krek 1999; Ježek 1992; Ježek et al. 2020, 2021).

***Paramormia* (*Duckhousiella*) *ustulata* (Walker, 1856)**
Unpublished record: Bohumír cupriferous mine near Dolní Vernéřovice **(9)**, ♂, 31.7.1998, J, INS 8035.
Comments. Holarctic species. Registered not only in 22 European countries, however, as well in Turkey, Transcaucasia, Azores, Canary I., Corsica, Madeira, Olanda I., Sardinia, Algeria, Israel, Morocco, Tunisia, Afghanistan, China, Iran, Mongolia, and the USA. Actualized occurrence is summarized, e.g., by Ježek & Yağci (2005), Ježek et al. (2019, 2020, 2021). It inhabits the vicinity of extreme localities in substrates of quite

different extreme chemical composition: salt works, saltboils, thermal springs, calcareous water and mineral–rich sources, soaks of open–cast coal mines and dumps, poultry farms, etc.

***Peripsychoda auriculata* (Haliday in Curtis, 1839)**
Unpublished records: Between Pomeznice and Ruprechtice **(8)**, 2 ♂♂, 20.7.1998, J, INS 8088 and 9149. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7325. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8095. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8131.
Comments. European (23 countries), West Siberian (Novosibirsk region), and Transcaucasian species (Abkhazia, incl. Georgia and Armenia). The species has not yet been recorded from the Iberian Peninsula, in contrast to the Balkans and the Apennines. An overview of the detailed distribution is given by Ježek et al. (2019, 2020, 2023a) and Morelli & Biscaccianti (2021).

***Peripsychoda fusca* (Macquart, 1826)**
Published record: Křinice env. Broumov **(22)** and Šonov env. Broumov **(38)** – Ježek (2003).
Degree of endangerment: Critically endangered (CR) – Ježek (2005).
Comments. Currently known to occur in 22 European countries – compare Ježek et al. (2020).

***Seoda carthusiana* (Vaillant, 1972)**
Unpublished record: Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7331.
Comments. European species, known from the Czech Republic, Estonia, France, Germany, Poland, Slovakia, and Slovenia (Ježek & Omelková 2012; Ježek et al. 2019; Oboňa et al. 2024a).

Trichopsychodina

***Philosepedon* (*Philosepedon*) *humerale* (Meigen, 1818)**
Unpublished record: Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8105.
Comments. A very common species registered in almost 30 countries. The species penetrates from Europe to Northern (Algeria) and Western Africa (Mauretania), some islands of the Atlantic Ocean (Azores, Canary Islands), the Indian Ocean (Seychelles), and the Mediterranean Sea (Cyprus). Larvae are conchibionts (Ježek 1986; Ježek et al. 2019, 2020, 2021; Oboňa et al. 2024b).

***Threticus incurvus* Krek, 1972**
Published records: Adršpach – Spálený Mlýn **(1)** and Dolní Adršpach **(2)** – Ježek (2003).
Degree of endangerment: Endangered (EN) – Ježek (2005).
Comments. European species. For more details, see, e.g. Krek (1999), Ježek (2003), Ježek & Omelková (2012), Ježek et al. (2020).

***Threticus lucifugus* (Walker, 1856)**
Unpublished records: Between Bystré and Stárkov **(4)**, ♂, 15.8.1997, J, INS 7309. Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8118. Pěkov near Police nad Metují **(30)**, ♂, 9.8.1996, J, INS 7316. Petříkovice env. Chvaleč **(31)**, ♂, 14.8.1998, J, INS 8045. Radvanice **(32)**, ♂, 14.8.1998, J, INS 8121. Vernéřovice env. Meziměstí **(40)**, ♂, 3.8.1999, J, INS 9118.
Comments. Species known from countries along the Northern Sea, penetrates to the British Isles, Central Europe, and the Apennines (Ježek et al. 2008, 2019; Beuk 2021).

***Threticus silvaticus* Ježek, 1985**
Unpublished record: Between Bystré and Stárkov **(4)**, ♂, 15.8.1997, J, INS 7306.
Degree of endangerment: Vulnerable (VU) – Ježek (2005).
Comments. A very rare Central European species, known only from the Czech Republic and Slovakia (Oboňa & Ježek 2014; Ježek et al. 2019, 2021).

***Trichopsychoda hirtella* (Tonnoir, 1919)**
Unpublished records: Červený Kostelec, Špinka pond **(14)**, ♀, 13.8.1997, J, INS 7240. Hronov – Velké Poříčí **(18)**, ♀, 4.8.1998, J, INS 9155. Libná – Zdoňovský potok brook **(23)**, ♂, 7.8.1998, J, INS 8047. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8093. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9143. Rokytník env. Hronov, cowshed (**34**), ♂, 26.7.1999, J, INS 9132. Stárkov **(37)**, ♂, 15.8.1997, J, INS 7292.
Comments. European species, collected in 13 countries, southern border of its distribution is limited by the Apennines and the Balkan; it penetrates to Transcaucasia (Abkhazia) and Russia (Mordovia) – Ježek et al. (2020, 2021, 2023a) and Oboňa et al. (2024a,b).

Psychodini

***Chodopsycha lobata* (Tonnoir, 1940)**
Unpublished record: Teplice nad Metují **(39)**, ♀, 3.8.1999, J, INS 9122.
Comments. European species, known from 21 countries, Transcaucasian sites represent Georgia, incl. Abkhazia, larvae are mycobionts – Wagner (1990, 2023) and Ježek et al. (2019, 2020, 2021, 2023a).

***Logima albipennis* (Zetterstedt, 1850)**
Unpublished records: Petříkovice env. Chvaleč **(31)**, ♀, 14.8.1998, J, INS 8044. Rokytník env. Hronov, Křížová area **(33)**, ♀, 26.7.1999, J, INS 9138. Stárkov **(37)**, ♀, 15.8.1997, J, INS 7295. Teplice nad Metují **(39)**, ♀, 3.8.1999, J, INS 9121.
Comments. A cosmopolitan species, some details see e.g. in Ježek & Yağci (2005) or Ježek et al. (2018, 2019, 2020, 2021).

***Logima erminea* (Eaton, 1893)**
Unpublished records: Hronov – Velké Poříčí **(18)**, ♀, 4.8.1998, J, INS 9160. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9130.
Comments. Palaearctic species, registered in 21 European countries, however, as well in Transcaucasia (Abkhazia), Tchaj–wan, Japan, and North Africa (Algeria) (Ježek et al. 2018, 2019, 2020, 2023a; Kvifte et al. 2011).

***Logima satchelli* (Quate, 1955)**
Unpublished records: Between Bystré and Stárkov **(4)**, ♀, 15.8.1997, J, INS 7307. Božanov – Na končinách **(10)**, M, 10.8.1998, J, INS 8108. Chlívce env. Rtyně v Podkrkonoší **(12)**, ♀, 15.8.1997, J, INS 7302. Hlavňov near Police nad Metují **(16)**, ♀, 9.8.1996, J, INS 7283. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7262. Libná – Zdoňovský potok brook **(23)**, ♀, 7.8.1998, J, INS 8051. Martínkovice, Punarův rybník pond **(27)**, ♀, 10.8.1998, J, INS 8060. Radvanice **(32)**, ♀, 10.8.1997, J, INS 7258. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9139. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9129. Stárkov **(37)**, ♂, 15.8.1997, J, INS 7293. Teplice nad Metují (**39**), ♂, 3.8.1999, J, INS 9119.
Comments. Holarctic species, registered in Europe, Anatolia, Transcaucasia (Armenia, Azerbaijan, Georgia, incl. Abkhazia), Canada, and the USA, e.g. Ježek & Yağci (2005) and Ježek et al. (2019, 2020, 2023a).

***Logima zetterstedti* Ježek, 1983**
Unpublished records: Malé Svatoňovice, Volský důl **(25)**, ♀, 10.8.1997, J, INS 7249. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9140. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9136. Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9128. Vernéřovice env. Meziměstí **(40)**, ♀, 3.8.1999, J, INS 9115.
Comments. European and West Siberian species (Novosibirsk region), known from 20 European countries, Turkey, the Atlantic Ocean (Azores, Canary Islands), the South Pacific Ocean (Fiji), and the boundary between the East China Sea and the Philippine Sea (Ryukyu Islands) – Ježek & Yağci (2005), Ježek (1992), and Ježek et al. (2019, 2020, 2021, 2023a). Without verification, it may probably be cosmopolitan.

***Psycha grisescens* (Tonnoir, 1922)**
Unpublished record: Pěkov near Police nad Metují **(30)**, ♀, 9.8.1996, J, INS 7319.
Comments. Collected in 21 European countries, inhabiting a zone from the British Isles to Lithuania, and Central Anatolia, Transcaucasia (Azerbaijan, Abkhazia), the northern border lies in the boreal ecoregion (Scandinavia), and the southern limits occur in North Africa (Algeria, Morocco, Tunisia), the Mediterranean Sea (Mallorca) and the North Atlantic archipelago (Faroe Islands) – Ježek et al. (2019, 2020, 2021, 2023a).

***Psychoda phalaenoides* (Linnaeus, 1758)**
Unpublished records: Between Pomeznice and Ruprechtice **(8)**, ♂, 20.7.1998, J, INS 8085. Libná – Zdoňovský potok brook **(23),** 2 ♀♀, 7.8.1998, J, INS 8050 and 8055. Pěkov near Police nad Metují **(30)**, ♀, 9.8.1996, J, INS 7318. Radvanice **(32)**, ♀, 10.8.1997, J, INS 7246. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9141. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9134. Šonov env. Broumov **(38)**, ♀, 16.6.1997, C, INS 7342. Zdoňov env. Meziměstí **(42)**, ♀, 7.8.1998, J, INS 8107.
Comments. Holarctic species – collected in 30 European countries. Known from Transcaucasia (Azerbaijan and Georgia, incl. Abkhazia), the Canary Islands from the Atlantic Ocean, the Balearic Islands, and Sardinia from the Mediterranean Sea; North Africa (Algeria), Tchaj–wan, Japan, New Zealand, Alaska, and Canada, see e.g. Wagner (1990, 2023), Ježek et al. (2020, 2021, 2023a) and Oboňa et al. (2019 a,b, 2024a,b).

***Psychoda uniformata* Haseman, 1907**
Unpublished record: Rokytník env. Hronov, cowshed **(34)**, ♀, 26.7.1999, J, INS 9133.
Comments. Holarctic species, described from the USA, recorded in seven European countries, penetrates to Turkey, Transcaucasia (Armenia, Azerbaijan), North Africa (Morocco), Israel, Mongolia, and Iran (Ježek & Braverman 2006; Ježek et al. 2008, 2020, 2021).

***Psychodocha gemina* (Eaton, 1904)**
Unpublished records: Horní Vernéřovice **(17)**, ♀, 10.8.1997, J, INS 7260. Hronov – Velké Poříčí **(18)**, ♀, 4.8.1998, J, INS 9158. Meziměstí env. Broumov **(28)**, ♀, 20.7.1998, J, INS 8096. Radvanice **(32)**, ♀, 10.8.1997, J, INS 7252. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9146. Stárkov (**37**), ♀, 15.8.1997, J, INS 7297. Teplice nad Metují **(39)**, ♀, 3.8.1999, J, INS 9123.
Comments. European species, known from 22 countries, penetrates to Transcaucasia (Azerbaijan, Georgia, incl. Abkhazia); see Wagner (1990, 2023), Ježek et al. (2018, 2019, 2020, 2021, 2023a).

***Psychomora trinodulosa* (Tonnoir, 1922)**
Unpublished records: Between Pomeznice and Ruprechtice **(8)**, ♀, 20.7.1998, J, INS 8087. Rokytník env. Hronov, Křížová area **(33)**, ♀, 26.7.1999, J, INS 9148. Rokytník env. Hronov, cowshed **(34)**, ♀, 26.7.1999, J, INS 9135. Stárkov **(37)**, ♀, 15.8.1997, J, INS 7294.
Comments. Holarctic species, registered in 27 European countries, penetrates Turkey (Anatolia) and Transcaucasia (Azerbaijan, Georgia), known from North Africa (Algeria), from the Mediterranean Sea (Sardinia), and many sites are from the USA. An overview of the detailed distribution is given by Ježek & Yağci (2005) and Ježek et al. (2019, 2020, 2021).

***Tinearia alternata* (Say, 1824)**
Unpublished records: Hronov – Velké Poříčí **(18)**, ♀, 4.8.1998, J, INS 9162. Otovice env. Broumov **(29)**, ♀, 10.8.1998, J, INS 8135. Radvanice **(32)**, ♀, 10.8.1997, J, INS 7256. Rokytník env. Hronov, Křížová area **(33)**, ♀, 26.7.1999, J, INS 9145. Stárkov **(37)**, ♂, 15.8.1997, J, INS 7291. Vysoká Srbská env. Hronov **(41)**, ♀, 31.7.1999, J, INS 9111. Žďárky env. Hronov **(43)**, ♀, 4.8.1998, J, INS 8065.
Comments. Cosmopolitan species, newly registered from Armenia, Azerbaijan, and Georgia, incl. Abkhazia (Ježek & Yağci 2005; Ježek et al. 2018, 2019, 2020, 2023a,b).

***Tinearia lativentris* (Berdén, 1952)**
Published record: Meziměstí **(28)** – Ježek (1977).
Comments. Holarctic species, known from 20 European countries, penetrates into Turkey, Afghanistan, and China. Some localities are in Western Asia (Israel, Syria), the Balearic Islands, and Sardinia in the Mediterranean Sea, and North Africa (Tunisia). Many collecting sites are known from Canada, the USA, Mexico, and Nicaragua (Ježek & Yağci 2005; Ježek 1992; Ježek et al. 2018, 2020, 2021).

***Ypsydocha setigera* (Tonnoir, 1922)**
Unpublished record: Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9127.
Comments. Holarctic species, occurrence in Europe: Belgium, Czech Republic, Denmark, France, Germany, Great Britain, Ireland, Italy, Norway, Romania, Slovakia, Spain, Sweden; penetrates to Transcaucasia, moreover known from Canada, the USA, and Japan (Ježek 2003; Ježek et al. 2019, 2021; Oboňa et al. 2019a,b).

Pericomaini

***Berdeniella manicata* (Tonnoir, 1920)**
Unpublished records: Dolní Adršpach **(2)**, ♂, 21.5.1997, J, INS 7277. Bohumír cupriferous mine near Dolní Vernéřovice **(9)**, ♂, 31.7.1998, J, INS 8038. Božanov – Na končinách **(10)**, ♂, 10.8.1998, J, INS 8110. Dědov near Teplice nad Metují **(15)**, ♂, 9.8.1996, J, INS 7286. Janovice env. Adršpach **(19)**, ♂, 31.7.1998, J, INS 8032. Pěkov near Police nad Metují **(30)**, ♂, 9.8.1996, J, INS 7321. Petříkovice env. Chvaleč **(31)**, ♂, 14.8.1998, J, INS 8040. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8072.
Comments. European species (registered in 17 countries), penetrates to Transcaucasia (Georgia incl. Abkhazia); see, e.g. Krek (1999), Wagner (1990, 2023), Ježek et al. (2023a) and Oboňa et al. (2019a,b).

***Berdeniella stavniensis* (Krek, 1969)**
Published record: Petříkovice env. Chvaleč **(31)** – Ježek (2003).
Comments. European species, known from Austria, Bosnia and Herzegovina, the Czech Republic, France, Germany, Serbia, Slovakia, and Ukraine (Krek 1999; Ježek 2003; Ježek et al. 2017, 2019, 2021).

***Berdeniella unispinosa* (Tonnoir, 1919)**
Unpublished record: Šonov env. Broumov **(38)**, ♂, 16.6.1997, C, INS 7340.
Comments. Distributed in the Central Zone of Europe from France to Poland and Slovakia, the southern border of the area lies in the Apennines and the Balkans (19 countries) (Krek 1999; Ježek et al. 2019, 2020, 2021).

***Berdeniella vimmeri* Ježek, 1997**
Unpublished records: Petříkovice env. Chvaleč **(31)**, ♂, 14.8.1998, J, INS 8046. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8078.
Degree of endangerment: Nationally scarce (NS).
Comments. European species, currently known to occur in the Czech Republic (Bohemia, Moravia, Silesia), Slovakia, Ukraine, and Bulgaria (Ježek et al. 2019, 2020; Kroča & Ježek 2022).

***Clytocerus* (*Boreoclytocerus*) *ocellaris* (Meigen, 1804)**
Unpublished records: Between Březová and Jetřichov **(3)**, ♂, 22.5.1997, J, INS 7269. Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8114. Between Křinice and Hejtmánkovice, Lesní školky forest nursery **(6)**, ♂, 22.5.1997, J, INS 7268. Between Pomeznice and Ruprechtice **(8)**, ♂, 20.7.1998, J, INS 8086 and 9153. Chlívce env. Rtyně v Podkrkonoší **(12)**, ♂, 15.8.1997, J, INS 7305. Červený Kostelec, Čermák pond **(13)**, ♂, 13.8.1997, J, INS 7334. Dědov near Teplice nad Metují **(15)**, ♂, 9.8.1996, J, INS 7288. Hlavňov near Police nad Metují **(16)**, ♂, 9.8.1996, J, INS 7282. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7266. Hronov – Velké Poříčí **(18)**, ♂, 4.8.1998, J, INS 9161. Janovice env. Adršpach **(19)**, ♂, 31.7.1998, J, INS 8034. Jívka env. Teplice nad Metují **(20)**, ♂, 31.7.1998, J, INS 8080. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7328. Libná – Zdoňovský potok brook **(23)**, 2 ♂♂, 7.8.1998, J, INS 8048 and 8056. Malé Svatoňovice, Volský důl **(25)**, ♂, 10.8.1997, J, INS 7244. Martínkovice, Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8058. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8094. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8132. Radvanice **(32)**, ♂, 10.8.1997, J, INS 7257. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9147. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9131. Ruprechtice **(35)**, ♂, 20.7.1998, J, INS 9109. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8074. Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9124. Vernéřovice env. Meziměstí **(40)**, ♂, 3.8.1999, J, INS 9113. Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8103. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8066.
Comments. Geographical distribution: Central and Western Europe (incl. the British Isles), the northern frontier of the area of occurrence lies in Finland, the southern border is limited by the Apennines and the Balkans, the species penetrates eastwards to Lithuania (25 countries, incl. Sardinia and Sicilia). An overview of the detailed distribution is given by Wagner (2023), Ježek et al. (2019, 2020) and Morelli & Biscaccianti (2021).

***Clytocerus* (*Boreoclytocerus*) *rivosus* (Tonnoir, 1919)**
Unpublished records: Between Pomeznice and Ruprechtice **(8)**, ♂, 20.7.1998, J, INS 8092. Jívka env. Teplice nad Metují **(20)**, ♂, 31.7.1998, J, INS 8082. Radvanice **(32)**, ♂, 14.8.1998, J, INS 8125.
Degree of endangerment: Critically endangered (CR) – Ježek (2005).
Comments. Known from 8 European countries (Ježek 2003; Ježek et al. 2014, 2019).

***Parabazarella subneglecta* (Tonnoir, 1922)**
Unpublished records: Dolní Adršpach **(2)**, ♂, 21.5.1997, J, INS 7278. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7261. Pěkov near Police nad Metují **(30)**, ♂, 9.8.1996, J, INS 7320. Radvanice **(32)**, ♂, 10.8.1997, J, INS 7250. Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8106. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8069.
Comments. A species of Eurasiatic distribution, registered from the Western and Central European zones from Belgium to Poland, eastwards Lithuania, the boreal Scandinavian ecoregion (Finland), the southern frontier is limited by the Balkans and Anatolia. A detailed distribution is given, e.g., by Ježek et al. (2019, 2020, 2021).

***Pericoma* (*Pachypericoma*) *blandula* Eaton, 1893**
Unpublished records: Bohumír cupriferous mine near Dolní Vernéřovice **(9)**, ♂, 31.7.1998, J, INS 8037. Božanov – Na končinách **(10)**, ♂, 10.8.1998, J, INS 8109. Libná – Zdoňovský potok brook **(23)**, ♂, 7.8.1998, J, INS 8054. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8098. Radvanice **(32)**, ♂, 10.8.1997, J, INS 7253.
Comments. Known from 31 European countries, recorded also in Transcaucasia (Armenia, Azerbaijan, Georgia, incl. Abkhazia), North Africa (Tunisia and Morocco), as well as in Sardinia (Ježek et al. 2019, 2020, 2023a).

***Pericoma* (*Pachypericoma*) *fallax* Eaton, 1893**
Unpublished records: Dolní Adršpach **(2)**, ♂, 21.5.1997, J, INS 7276. Bohumír cupriferous mine near Dolní Vernéřovice **(9)**, ♂, 31.7.1998, J, INS 8039. Božanov – Na končinách **(10)**, ♂, 10.8.1998, J, INS 8111. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7265. Hronov – Velké Poříčí **(18)**, ♂, 4.8.1998, J, INS 9156. Libná – Zdoňovský potok brook **(23)**, ♂, 7.8.1998, J, INS 8049. Meziměstí env. Broumov **(28)**, ♂, 5.9.1972, J, INS 8120. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8134. Pěkov near Police nad Metují **(30)**, ♂, 9.8.1996, J, INS 7317. Petříkovice env. Chvaleč **(31)**, ♂, 14.8.1998, J, INS 8043. Radvanice **(32)**, ♂, 10.8.1997, J, INS 7254. Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9125.
Comments. European and West Siberian species, recorded in 20 countries, penetrates into Turkey, Transcaucasia (Armenia, Azerbaijan, Georgia, incl. Abkhazia), and North Africa (Algeria, Morocco, Tunisia), as well as from the Mediterranean Sea (Sardinia). A list of the detailed distribution is given, e.g., by Ježek et al. (2019, 2020, 2021, 2023b) and Oboňa et al. (2019a,b).

***Pneumia canescens* (Meigen, 1804)**
Unpublished records: Martínkovice – Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8062. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8099. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8129.
Comments. A species is widely distributed in Europe, western Siberia and penetrates into Turkey, Armenia, Kyrgyzstan, Afghanistan, and China (Wagner 1990, 2023; Ježek 1992; Ježek et al. 2020).

***Pneumia cubitospinosa* (Jung, 1954)**
Published record: Božanov, Koruna hill **(11)** – Ježek (2003).
Degree of endangerment: Endangered (EN) – Ježek (2005).
Comments. Rare European species known from Bosnia, Czech Republic, Denmark, France, Germany, Italy, Poland, Slovakia, and Switzerland (Ježek 2003, 2006; Oboňa & Ježek 2014).

***Pneumia nubila* (Meigen, 1818)**
Unpublished records: Červený Kostelec, Špinka pond **(14)**, ♂, 13.8.1997, J, INS 7245. Hronov – Velké Poříčí **(18)**, ♂, 4.8.1998, J, INS 9154. Kostelecké Končiny env. Horní Radechová **(21)**, ♂, 13.8.1997, J, INS 7298. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7326. Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8104.
Comments. Known from 29 European countries, registered from Spain and the British Isles throughout Scandinavia, Poland, and Lithuania. The southern border of its distribution is limited by the Apennines, the Balkans and Transcaucasia (Abkhazia, Armenia, Azerbaijan, and Georgia). Recorded also from Sardinia and the Canary Islands. An overview of the detailed distribution is given by Wagner (2023), Ježek & Hájek (2007) – erratum for printer´s error in Ježek (2004b), Ježek et al. (2019, 2020, 2021, 2023 a,b) and Oboňa et al. (2019 a,b).

***Pneumia palustris* (Meigen, 1804)**
Unpublished records: Martínkovice, Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8061. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8077.
Comments. Mainly European species (24 countries), penetrates to some islands such as Canary I., Corsica, and Crete, as well as to Turkey and Transcaucasia (Georgia, incl. Abkhazia): Ježek & Hájek (2007) – erratum for printer´s error in Ježek (2004b), Ježek et al. (2019, 2020, 2021, 2023 b).

***Pneumia trivialis* (Eaton, 1893)**
Unpublished records: Adršpach – Spálený Mlýn **(1)**, ♂, 21.5.1997, J, INS 7336. Dolní Adršpach **(2)**, ♂, 21.5.1997, J, INS 7275. Between Březová and Jetřichov **(3)**, ♂, 22.5.1997, J, INS 7270. Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8115. Between Křinice and Hejtmánkovice, Lesní školky forest nursery **(6)**, ♂, 22.5.1997, J, INS 7267. Between Křinice and

Hejtmánkovice, Šlégl pond **(7)**, ♂, 22.5.1997, J, INS 7311. Between Pomeznice and Ruprechtice **(8)**, 2 ♂♂, 20.7.1998, J, INS 8089 and 9151. Bohumír cupriferous mine near Dolní Vernéřovice **(9)**, ♂, 31.7.1998, J, INS 8036. Božanov – Na končinách **(10)**, ♂, 10.8.1998, J, INS 8112. Božanov, Koruna hill **(11)**, ♂, 20.5.1997, J, INS 7314. Chlívce env. Rtyně v Podkrkonoší **(12)**, ♂, 15.8.1997, J, INS 7303. Červený Kostelec, Čermák pond **(13)**, ♂, 13.8.1997, J, INS 7333. Červený Kostelec, Špinka pond **(14)**, ♂, 13.8.1997, J, INS 7241. Dědov near Teplice nad Metují **(15)**, ♂, 9.8.1996, J, INS 7289. Hlavňov near Police nad Metují **(16)**, M, 9.8.1996, J, INS 7280. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7259. Hronov – Velké Poříčí **(18)**, ♂, 4.8.1998, J, INS 9159. Janovice env. Adršpach **(19)**, ♂, 31.7.1998, J, INS 8033. Jívka env. Teplice nad Metují **(20)**, ♂, 31.7.1998, J, INS 8081. Kostelecké Končiny env. Horní Radechová **(21)**, ♂, 13.8.1997, J, INS 7299. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7332. Libná – Zdoňovský potok brook **(23)**, 2 ♂♂, 7.8.1998, J, INS 8052 and 8057. Malé Svatoňovice – Panská cesta way **(24)**, ♂, 10.8.1997, J, INS 7313. Malé Svatoňovice, Volský důl **(25)**, ♂, 10.8.1997, J, INS 7243. Malé Svatoňovice, Žaltman hill **(26)**, ♂, 10.8.1997, J, INS 7271. Martínkovice, Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8063. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8100. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8130. Pěkov near Police nad Metují **(30)**, ♂, 9.8.1996, J, INS 7322. Petříkovice env. Chvaleč **(31)**, ♂, 14.8.1998, J, INS 8042. Radvanice **(32)**, 2 ♂♂, 10.8.1997 and 14.8.1998, J, INS 7255 and 8122. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9144. Rokytník env. Hronov, cowshed **(34)**, ♂, 26.7.1999, J, INS 9137. Ruprechtice **(35)**, ♂, 20.7.1998, J, INS 9108. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8075. Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9120. Vernéřovice env. Meziměstí **(40)**, ♂, 3.8.1999, J, INS 9117. Vysoká Srbská env. Hronov **(41)**, ♂, 31.7.1999, J, INS 9112. Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8101. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8070.

Comments. A ubiquitous European species (23 countries) covering the zone from the Iberian Peninsula and the British Islands to Poland and Ukraine (not recorded in Russia), penetrates to the boreal ecoregion (Scandinavia), the southern frontier is limited by the Balkan. In the last decade, it has also been registered in Transcaucasia (Azerbaijan and Georgia, incl. Abkhazia). Some details are mentioned by Wagner (1990, 2023) and Ježek et al. (2019, 2020, 2021, 2023 b).

***Pneumia vittata* (Tonnoir, 1919)**

= syn. *Pneumia crispi* (Freeman, 1953) as well as *Pneumia hungarica* (Szabó, 1960) – reclassified by Ježek et al. (2020).

Unpublished records: Dědov near Teplice ad Metují **(15)**, ♂, 9.8.1996, J, INS 7287. Malé Svatoňovice, Žaltman hill **(26)**, ♂, 10.8.1997, J, INS 7274.

Degree of endangerment: Endangered (EN) – Ježek (2005).

Comments. Currently known to occur in 16 European countrie, compare, e.g., Wagner (1990), Krek (1999), and Ježek et al. (2020).

***Saraiella rotunda* (Krek, 1970)**

Unpublished records: Adršpach – Spálený Mlýn **(1)**, ♂, 21.5.1997, J, INS 7335. Božanov, Koruna hill **(11)**, ♂, 20.5.1997, J, INS 7315. Radvanice **(32)**, ♂, 14.8.1998, J, INS 8124.

Degree of endangerment: Critically endangered (CR) – Ježek (2005).

Comments. Probably Sub–Mediterranean mountainous species, registered in 9 European countries, penetrates into Transcaucasia (Azerbaijan, Georgia, incl. Abkhazia) (Wagner 2023; Ježek et al. 2019, 2020, 2021, 2023 a,b).

***Szaboiella hibernica* (Tonnoir, 1940)**

Published record: Šonov env. Broumov **(38)** – Ježek (2004).

Degree of endangerment: Critically endangered (CR) – Ježek (2005).

Comments. European species (11 countries), with a distribution zone covering the Iberian Peninsula, the British Islands, the coast of the Northern Sea and central European mountains, the Apennines, and the Balkan Peninsula, penetrates into Transcaucasia (Abkhazia). For more details, see, e.g. Ježek (2004a, 2019) and Ježek et al. (2021, 2023 b).

***Tonnoiriella nigricauda* (Tonnoir, 1919)**

Unpublished records: Červený Kostelec, Špinka pond **(14)**, ♂, 13.8.1997, J, INS 7248. Jívka env. Teplice nad Metují **(20)**, ♂, 31.7.1998, J, INS 8083. Vernéřovice env. Meziměstí **(40)**, ♂, 3.8.1999, J, INS 9116. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8067.

Degree of endangerment: Critically endangered (CR) – Ježek (2005).

Comments. European species, known from nine countries. Some details, see, e.g. Wagner (2023), Kvifte et al. (2011), Ježek et al. (2019, 2021).

***Tonnoiriella pulchra* (Eaton, 1893)**

Unpublished records: Between Pomeznice and Ruprechtice **(8)**, ♂, 20.7.1998, J, INS 8090. Hlavňov near Police nad Metují **(16)**, ♂, 9.8.1996, J, INS 7281. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7330. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8133.

Comments. Known from Western, Southern, and Central Europe (12 countries). Also recorded in North Africa (Algeria, Morocco). Details see in Afzan & Belqat (2016), Wagner (2023), Ježek & Omelková (2012) and Ježek et al. (2019, 2020, 2021).

***Ulomyia annulata annulata* (Tonnoir, 1919)**

Unpublished records: Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8113. Between Pomeznice and Ruprechtice **(8)**, 2 ♂♂, 20.7.1998, J, INS

8091 and 9150. Červený Kostelec, Špinka pond **(14)**, ♂, 13.8.1997, J, INS 7247. Janovice env. Adršpach **(19)**, ♂, 31.7.1998, J, INS 8031. Jívka env. Teplice nad Metují **(20)**, ♂, 31.7.1998, J, INS 8079. Malé Svatoňovice, Žaltman hill **(26)**, ♂, 10.8.1997, J, INS 7273. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8128. Radvanice **(32)**, ♂, 10.8.1997, J, INS 7251. Žďárky env. Hronov **(43)**, ♂, 4.8.1998, J, INS 8071.

Comments. The European and West Siberian subspecies, known from Austria, Belgium, Czech Republic, Germany, Lithuania, and Slovakia, penetrates into the Novosibirsk region in Russia. Compare, e.g., Ježek (1992), Ježek & Omelková (2012), Ježek et al. (2008, 2019) and Wagner (2023).

***Ulomyia cognata* (Eaton, 1893)**

Unpublished records: Between Bystré and Stárkov **(4)**, ♂, 15.8.1997, J, INS 7308. Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8119. Chlívce env. Rtyně v Podkrkonoší **(12)**, ♂, 15.8.1997, J, INS 7301. Hlavňov near Police nad Metují **(16)**, ♂, 9.8.1996, J, INS 7285. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7264. Kostelecké Končiny env. Horní Radechová **(21)**, ♂, 13.8.1997, J, INS 7300. Libná – Zdoňovský potok brook **(23)**, ♂, 7.8.1998, J, INS 8053. Martínkovice, Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8059. Radvanice **(32)**, ♂, 14.8.1998, J, INS 8126. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8073. Stárkov **(37)**, ♂, 15.8.1997, J, INS 7296. Teplice nad Metují **(39)**, ♂, 3.8.1999, J, INS 9126.

Comments. European species, known from 12 countries, penetrates into Transcaucasia (Armenia, Georgia, incl. Abkhazia); some details, see, e.g., in Wagner (1990), Ježek et al. (2008, 2021, 2023a,b).

***Ulomyia fuliginosa* (Meigen, 1804)**

Unpublished records: Between Janovice and Horní Vernéřovice **(5)**, ♂, 31.7.1998, J, INS 8117. Between Pomeznice and Ruprechtice **(8)**, 2 ♂♂, 20.7.1998, J, INS 8084 and 9152. Chlívce env. Rtyně v Podkrkonoší **(12)**, ♂, 15.8.1997, J, INS 7304. Červený Kostelec, Špinka pond **(14)**, ♂, 13.8.1997, J, INS 7242. Dědov near Teplice nad Metují **(15)**, ♂, 9.8.1996, J, INS 7290. Hlavňov near Police nad Metují **(16)**, ♂, 9.8.1996, J, INS 7284. Horní Vernéřovice **(17)**, ♂, 10.8.1997, J, INS 7263. Křinice env. Broumov **(22)**, ♂, 22.5.1997, J, INS 7323. Malé Svatoňovice, Žaltman hill **(26)**, ♂, 10.8.1997, J, INS 7272. Martínkovice, Punarův rybník pond **(27)**, ♂, 10.8.1998, J, INS 8064. Meziměstí env. Broumov **(28)**, ♂, 20.7.1998, J, INS 8097. Otovice env. Broumov **(29)**, ♂, 10.8.1998, J, INS 8127. Radvanice **(32)**, ♂, 14.8.1998, J, INS 8123. Rokytník env. Hronov, Křížová area **(33)**, ♂, 26.7.1999, J, INS 9142. Sedmákovice near Vysoká Srbská **(36)**, ♂, 4.8.1998, J, INS 8076. Šonov env. Broumov **(38)**, ♂, 16.6.1997, C, INS 7341. Vernéřovice env. Meziměstí **(40)**, ♂, 3.8.1999, J, INS 9114. Zdoňov env. Meziměstí **(42)**, ♂, 7.8.1998, J, INS 8102.

Comments. Generally, one of the most abundant species, widely distributed, known throughout nearly all of Europe (29 countries). Data from Eastern Europe are limited (only Lithuania has positive funds). A detailed distribution is given by Wagner (2023) and Ježek et al. (2017, 2019, 2020, 2021).

In the present study were recorded 48 species, which represent approximately 26.96 % of all known moth flies (Diptera, Psychodidae – 178 species, see appendix in Ježek et al. (2021)) known from the Czech Republic. In 16 sites (37.20 %) were recorded species with a conservation potential / status.

The detailed overview of all recorded species per site is summarized in Tab 1. The highest biodiversity was recorded at the sites: 32 (15 spp.), 33 (11 spp.), 22, 28 and 39 (10 spp.), 8, 18, 29 and 34 (9 spp.), 17, 23, and 43 (8 spp.), 5, 27, 30, 31, 37 and 42 (7 spp.), 14, 16, 36 and 40 (6 spp.), 2, 9, 10, 12, 15, 20 and 38 (5 spp.), 4, 19 and 26 (4 spp.), 1, 7, 11, 21, 25 and 41 (3 spp.), 3, 6, 13 and 35 (2 spp.). Only one species is recorded at site 24.

The highest biodiversity of species with a conservation potential was recorded at sites 1, 11, 20, 32 and 38 (2 spp.), 2, 4, 8, 14, 15, 22, 26, 31, 36, 40 and 43 with one species only.

Table 1. List of localities with recorded species (see Figure 2 and 3)

No.	Site	Recorded species
1	Adršpach – Spálený Mlýn	*incurvus* (EN), *trivialis, rotunda* (CR)
2	Dolní Adršpach	*incurvus* (EN), *manicata, subneglecta, fallax, trivialis*
3	Between Březová and Jetřichov	*ocellaris, trivialis*
4	Between Bystré and Stárkov	*lucifugus, silvaticus* (VU), *satchelli, cognata*
5	Between Janovice and Horní Vernéřovice	*polyascoidea, lucifugus, ocellaris, trivialis, a. annulata, cognata, fuliginosa*
6	Between Křinice and Hejtmánkovice, Lesní školky forest nursery	*ocellaris, trivialis*
7	Between Křinice and Hejtmánkovice, Šlégl pond	*longicornis, polyascoidea, trivialis*
8	Between Pomeznice and Ruprechtice	*auriculata, phalaenoides, trinodulosa, ocellaris, rivosus* (CR), *trivialis, pulchra, a. annulata, fuliginosa*

Table 1. Continued.

9	Bohumír cupriferous mine near Dolní Vernéřovice	*ustulata, manicata, blandula, fallax, trivialis*
10	Božanov –Na končinách	*satchelli, manicata, blandula, fallax, trivialis*
11	Božanov, Koruna hill	*cubitospinosa* (EN), *trivialis, rotunda* (CR)
12	Chlívce env. Rtyně v Podkrkonoší	*satchelli, ocellaris, trivialis, cognata, fuliginosa*
13	Červený Kostelec, Čermák pond	*ocellaris, trivialis*
14	Červený Kostelec, Špinka pond	*hirtella, nubila, trivialis, nigricauda* (CR), *a. annulata, fuliginosa*
15	Dědov near Teplice nad Metují	*manicata, ocellaris, trivialis, vittata* (EN), *fuliginosa*
16	Hlavňov near Police nad Metují	*satchelli, ocellaris, trivialis, pulchra, cognata, fuliginosa*
17	Horní Vernéřovice	*satchelli, gemina, ocellaris, subneglecta, fallax, trivialis, cognata, fuliginosa*
18	Hronov – Velké Poříčí	*notabilis, hirtella, erminea, gemina, alternata, ocellaris, fallax, nubila, trivialis*
19	Janovice env. Adršpach	*manicata, ocellaris, trivialis, a. annulata*
20	Jívka env. Teplice nad Metují	*ocellaris, rivosus* (CR), *trivialis, nigricauda* (CR), *a. annulata*
21	Kostelecké Končiny env. Horní Radechová	*nubila, trivialis, cognata*
22	Křinice env. Broumov	*soleata, longicornis, auriculata, fusca* (CR), *carthusiana, ocellaris, nubila, trivialis, pulchra, fuliginosa*
23	Libná – Zdoňovský potok brook	*hirtella, satchelli, phalaenoides, ocellaris, blandula, fallax, trivialis, cognata*
24	Malé Svatoňovice – Panská cesta way	*trivialis*
25	Malé Svatoňovice, Volský důl	*zetterstedti, ocellaris, trivialis*
26	Malé Svatoňovice, Žaltman hill	*trivialis, vittata* (EN), *a. annulata, fuliginosa*
27	Martínkovice, Punarův rybník pond	*satchelli, ocellaris, canescens, palustris, trivialis, cognata, fuliginosa*
28	Meziměstí env. Broumov	*auriculata, hirtella, gemina, lativentris, ocellaris, blandula, fallax, canescens, trivialis, fuliginosa*
29	Otovice env. Broumov	*auriculata, alternata, ocellaris, fallax, canescens, trivialis, pulchra, a. annulata, fuliginosa*
30	Pěkov near Police nad Metují	*lucifugus, grisescens, phalaenoides, manicata, subneglecta, fallax, trivialis*
31	Petříkovice env. Chvaleč	*lucifugus, albipennis, manicata, stavniensis, vimmeri* (NS), *fallax, trivialis*
32	Radvanice	*lucifugus, satchelli, phalaenoides, gemina, alternata, ocellaris, rivosus* (CR), *subneglecta, blandula, fallax, trivialis, rotunda* (CR), *a. annulata, cognata, fuliginosa*
33	Rokytník env. Hronov, Křížová area	*hirtella, albipennis, satchelli, zetterstedti, phalaenoides, gemina, trinodulosa, alternata, ocellaris, trivialis, fuliginosa*
34	Rokytník env. Hronov, cowshed	*hirtella, erminea, satchelli, zetterstedti, phalaenoides, uniformata, trinodulosa, ocellaris, trivialis*
35	Ruprechtice	*ocellaris, trivialis*
36	Sedmákovice near Vysoká Srbská	*vimmeri* (NS), *ocellaris, palustris, trivialis, cognata, fuliginosa*
37	Stárkov	*hirtella, albipennis, satchelli, gemina, trinodulosa, alternata, cognata*
38	Šonov env. Broumov	*fusca* (CR), *phalaenoides, unispinosa, hibernica* (CR), *fuliginosa*
39	Teplice nad Metují	*lobata, albipennis, satchelli, zetterstedti, gemina, setigera, ocellaris, fallax, trivialis, cognata*
40	Vernéřovice env. Meziměstí	*lucifugus, zetterstedti, ocellaris, trivialis, nigricauda* (CR), *fuliginosa*
41	Vysoká Srbská env. Hronov	*notabilis, alternata, trivialis*
42	Zdoňov env. Meziměstí	*humerale, phalaenoides, ocellaris, subneglecta, nubila, trivialis, fuliginosa*
43	Žďárky env. Hronov	*polyascoidea, alternata, manicata, ocellaris, subneglecta, trivialis, nigricauda* (CR), *a. annulata*

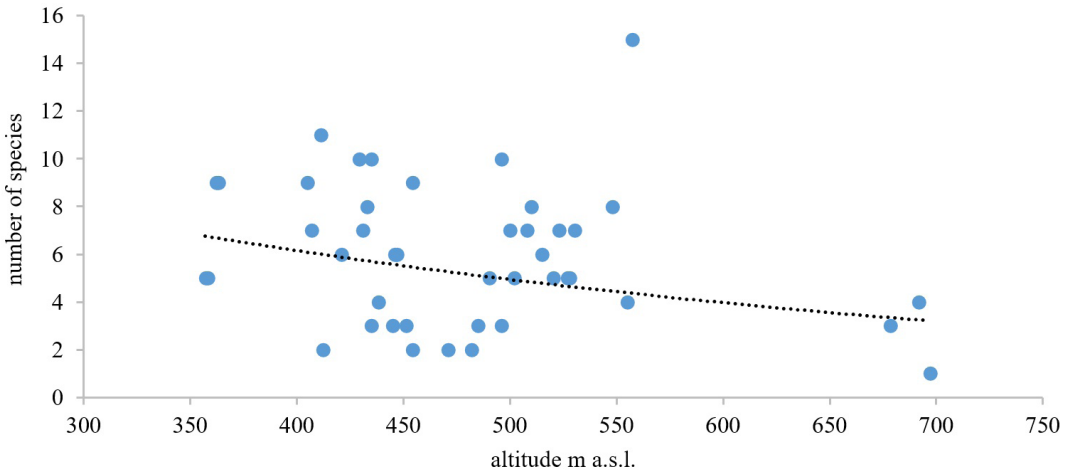

Figure 18. Altitude and the number of species of moth flies at sampling sites, with an exponential trend line (created by Jozef Oboňa).

If we analyze the relationship between elevation and the number of species, the trend lines in Figure 18 initially indicate a decrease in the number of species with altitude. But only 9 % (coefficient of determination $R^2 = 0.0918$) of the variance in the dependent variable is explained by the exponential model (5 % (coefficient of determination $R^2 = 0.00537$ by the linear – not shown in graph)).

In the analysis of the relationship between altitude and the number of species with conservation status (see Kroča & Ježek 2015, 2019, 2022; Ježek et al. 2024a,b,c); see the trend line in Figure 19. At first glance, it indicates a trend, but in this case, it explains the increase in the number of species with conservation potential with an altitude of only 1 % (determination coefficient $R^2 = 0.01$).

None of the tests performed confirmed a significant relationship between the number of species, altitude, and the number of protected species. Similar results are also confirmed by previous works (Ježek et al. 2024a,b,c).

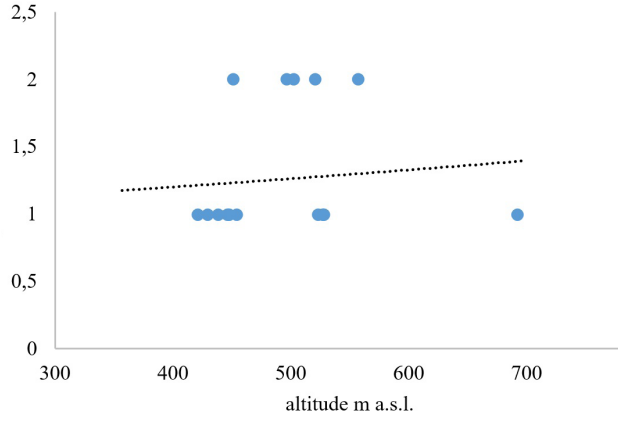

Figure 19. Altitude and the number of species with conservation potential of moth flies at sampling sites, with an exponential trend line (created by Jozef Oboňa).

A good knowledge of biodiversity is the basic building block of many research studies, classifications, and last but not least, knowledge of the ecology and biology of selected species. This knowledge can be applied to the protection of endangered species, as well as the management of their habitats (e.g. Ježek et al. 2024a,b,c).

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Original paper

An overview of invasive insect species in the city of Prešov

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Abstract
The topic of invasion is a constantly relevant and popular issue these days. This work therefore provides an overview of the invasive insect species that occur in the city of Prešov, Slovakia. We summarize the literature data, with six invasive species already known from Prešov, and we also bring seven newly recorded invasive insects. We recorded the invasive pests of woody plants (*Cameraria ohridella* (Deschka & Dimic, 1986), *Corythucha ciliata* (Say, 1832), *Parectopa robiniella* (Clemens, 1863)), of fruit pests (*Drosophila suzukii* (Matsumura, 1931), *Harmonia axyridis* (Pallas, 1773)), as well as epidemiologically significant invasive species (*Aedes japonicus japonicus* (Theobald, 1901), *Clogmia albipunctata* (Williston, 1893), *Lipoptena fortisetosa* (Maa, 1965)). This number of species is certainly not complete, and even more attention needs to be paid to this topic in the future.

Key words: invasions, invasive insects, non-native insects, urban ecosystem, Slovakia

Introduction

From the viewpoint of biodiversity, insects represent one of the most diverse groups of organisms (Kim 1993), and in terms of biomass, approximately 1,500 kilograms of insects are estimated to exist per person (Dicke 2018). This dominant form of animal biomass represents various trophic groups and fulfils a wide range of ecological functions (Gullan & Cranston 2010).

Many non-native insect species are often referred to as pioneers or colonists due to their ability to quickly adapt to new ecosystem conditions (Pearce 2016). However, the introduction of new insect species into ecosystems may not always have a positive impact, as many insect species are capable of becoming invasive and can reduce and otherwise suppress populations of many native species (Mascaro 2013) and also cause economic and ecological damage (Nevřelová & Becková 2015).

The issue of invasive insects has become increasingly topical in recent years, as evidenced by the growing number of publications dealing with this subject. Venette & Hutchison (2021) address the global challenges, strategies and opportunities that invasions bring. Fortuna et al. (2022) examine the impact of invasive insects on native insect communities and, for example, Skendžić et al. (2021) look at the impact of climate change on the spread of agricultural invasive insect pests in Europe.

In Slovakia, a relatively large number of introduced insect species of an invasive or expansive nature have already been recorded and registered. A detailed list is presented in Kohútová & Oboňa (2016). According to the available information, there are 386 non-native insect species in Slovakia, 89 of which are considered invasive (Insecta: Coleoptera: 21, Diptera: 6, Heteroptera: 7, Hemiptera: 29, Hymenoptera: 12, Lepidoptera: 14). This list already needs to be supplemented with information from Janský & Strmisková (2017), Oboňa et al. (2017), Borbély et al. (2020), Čabanová et al. (2021), Dvořák & Fryč (2023), etc.

In this work, we will therefore focus on invasive insects that occur in the city of Prešov, Slovakia.

Material and methods

Field research was conducted during the 2023 growing season in selected parts of the city of Prešov (especially parts of the old town – Staré mesto, housing estate 2 and housing estate 3 (Sídlisko 2 and 3); see Figure 1).

Figure 1. Map of the city of Prešov with marked areas where field research was conducted (https://www.google.com/maps; created by S. K Tkáčová).

It consisted of extensive walks, during which optical methods were used to (visually) record possible invasive taxa of insects or their residence signs (leaf eaters, galls,

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etc.). In addition to the field research, literature research was also conducted in parallel, where we searched for key words, "invasive", "insect", "Prešov", or their language variations from freely available sources in the database https://scholar.google.sk/.

Invasive species recorded in the city of Prešov are arranged alphabetically according to their Latin names. For each species a published record from Prešov (if it exists), knowledge from the field and basic information about invasive insects are given.

Results and Discussion

A total of 13 invasive insect species were recorded in the territory of the town of Prešov (field research and literature review; see species list below).

***Aedes japonicus japonicus* (Theobald, 1901)**
Ordo: Diptera
Published records: Oboňa et al. (2020, 2021), Čabanová et al. (2021).
Material examined: Kolmanka (48°59'29.4"N 21°13'35.3"E), 30.5.2023, sweep netting of vegetation (Figure 2).
Comments: This invasive mosquito spreads very quickly throughout the world and has a significant impact on the biodiversity of the invaded areas. In addition, we consider it a carrier of diseases, pathogens or viruses. It is often found in city parks, forests or rock lakes. In Europe, it was first recorded in 2000 in France and has gradually spread throughout the continent (Becker et al. 2010; Čabanová et al. 2021).

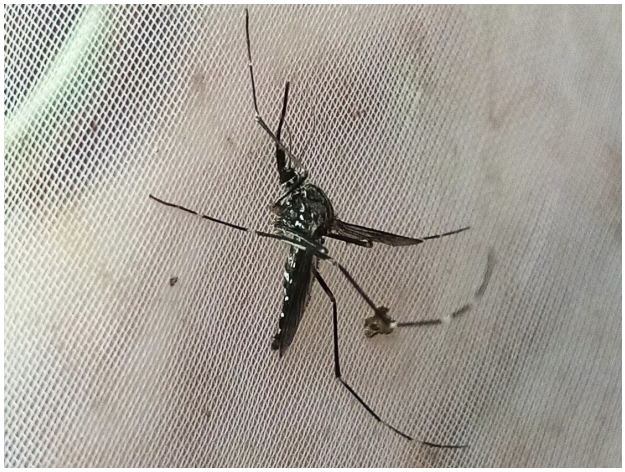

Figure 2. *Aedes japonicus japonicus* (Theobald, 1901) from Kolmanka. Photo by J. Oboňa.

***Aphrastasia pectinatae* (Cholodkovsky, 1888)**
Ordo: Hemiptera
Material examined: Československej armády street (48°59'53.3"N 21°13'37.1"E), 30.5.2023, on *Larix decidua* Mill.
Comments: This is a small and inconspicuous pest that forms cotton-wax tufts on conifers. It is often found in parks. It is originally a Nearctic species that was imported to Europe together with the tree *Pseudotsuga menziesii* (Mirb. (Franco)). When overly abundant, it can cause economic damage (Albrecht 2017).

***Cameraria ohridella* (Deschka & Dimic, 1986)**
Ordo: Lepidoptera
Material examined: Levočská ulica street (49°00'03.8"N 21°13'20.9"E), Obrancov mieru street (48°59'50.5"N 21°13'41.2"E), 16.9.2023.
Comments: A tiny butterfly whose larvae mine leaves of *Aesculus hippocastanum* L. It was first recorded in North Macedonia in 1986 (Deschka & Dimic 1986); later, it spread to Austria (Pschorn-Walcher 1994) Germany, Hungary and the Czech Republic. It was first recorded in Slovakia in 1994, in the vicinity of Bratislava (Reiprich 1994; Hrubík & Kollár 2007). This species causes significant damage, especially late-summer leaf browning on buckeye. Despite the bad appearance of these infested trees, there is no evidence that this damage leads to the death of the tree. Most damage appears to occur too late in the growing season to significantly affect tree vigour (Šefrová & Laštůvka 2001).

***Clogmia albipunctata* (Williston, 1893)**
Ordo: Diptera
Published records: Oboňa et al. (2016).
Material examined: On the walls of buildings; abundantly in/on most buildings (e.g. 48°59'45.0"N 21°13'55.2"E; 48°59'28.8"N 21°14'06.2"E; 48°59'47.7"N 21°14'14.4"E; 48°59'51.2"N 21°13'20.5"E; etc…), especially in late summer and autumn, frequent in public toilets.
Comments: This is an expansive species, found mainly in urban habitats due to favourable conditions for wintering. This species is less conspicuous but is assumed to occur throughout almost all of Europe (Oboňa et al. 2016, 2023; Baranová & Oboňa 2024; Kvifte 2023).

***Corythucha ciliata* (Say, 1832)**
Ordo: Hemiptera
Material examined: Námestie mládeže street (48°59'44.2"N 21°13'47.4"E), 6.9.2023, on *Platanus* × *hispanica* Münchh.
Comments: This is a significant pest of plane trees. It represents a threat, especially to trees of the genus *Platanus* (*P. occidentalis* L., *P. orientalis* L., *P.* × hispanica) (Malumphy et al. 2007; Mutun 2009). This species comes from North America. From there, it was accidentally introduced to Italy in the 1960s and later spread to other countries (Paulin et al. 2020). It first appeared in Slovakia in the 1990s in Bratislava and Rusovce (Tomiczek et al. 2005).

***Cydalima perspectalis* (Walker, 1859)**
Ordo: Lepidoptera
Material examined: Levočská street 63 (48°59'55.7"N 21°13'28.0"E), 24.9.2023, on *Buxus*.

Comments: This moth is found from the end of May to the end of October. It mainly attacks *Buxus*, while the female lays her eggs on their leaves. The damaged leaves then dry up and fall off (Rell et al. 2017). This butterfly was first recorded in Slovakia in Bratislava in 2012 (Pastorális et al. 2013). Currently, it occurs in a large part of Slovakia, while greater damage was reported mainly in the southern parts of western, central and eastern Slovakia (Rell et al. 2017).

***Drosophila suzukii* (Matsumura, 1931)**
Ordo: Diptera
Published records: Oboňa et al. (2017, 2021).
Comments: This fly is originally from Southeast Asia. This invasive insect appeared at the end of the 20th century in America and Europe as one of the most common pests of small and stone fruits. In 2012, its occurrence was recorded in Hungary (Kiss et al. 2013), in 2014 in the Czech Republic (Březíková et al. 2014), in 2015 in Slovakia (NPPO Slovenska 2014; Asplen et al. 2015; Oboňa et al. 2017) and in the same year also in Poland (Łabanowska & Piotrowski 2015; Asplen et al. 2015).

***Harmonia axyridis* (Pallas, 1773)**
Ordo: Coleoptera
Material examined: Levočská ulica street (48°59'55.7"N 21°13'28.0"E), Námestie mládeže (48°59'44.2"N 21°13'47.4"E), 17. Novembra street (48°59'31.9"N 21°13'58.8"E) (Figure 3), 6.9.2023. Walls of buildings in different parts of the city, especially in autumn 2023.
Comments: This is one of the most invasive species in the ladybug family (Coccinellidae). It has a negative impact on the environment and native communities, causing great damage to vineyards (Katsanis et al. 2013, 2017). This predator is originally from central and eastern Asia and Eurasia, including China, Taiwan, Japan, Mongolia and northern central and eastern China (Roy & Brown 2015). In Slovakia, it appeared for the first time in 2008 in the Tatras, specifically in the Tichá dolina valley and in the settlement of Podbanské (Panigaj et al. 2014).

Figure 3. *Harmonia axyridis* (Pallas, 1773) from 17. Novembra street. Interesting colour aberration. Photo by S. K Tkáčová.

***Leptoglossus occidentalis* (Heidemann, 1910)**
Ordo: Hemiptera
Material examined: Autumn 2023. Walls of apartment buildings in several places in the Prešov city streets: Československej armády (48°59'51.6"N 21°13'29.8"E), Marka Čulena (48°59'52.3"N 21°13'20.0"E), 17. Novembra (48°59'32.3"N 21°14'01.6"E), etc.
Comments: This is one of the largest terrestrial stink bugs in Central Europe. This pest attacks conifers, especially pines, firs and spruces. It was recorded for the first time in Slovakia in 2007 (Barta 2009).

***Lipoptena fortisetosa* (Maa, 1965)**
Ordo: Diptera
Published records: Oboňa et al. (2019).
Material examined: September 2023. The tree line between the streets Československej armády 34 – 40 and Marka Čulena 1 – 16 (48°59'50.8"N 21°13'21.6"E). Inner part of the city of Prešov (49°00'04.8"N 21°13'04.6"E).
Comments: This is a small and annoying blood-sucking dipteran, originally from East Asia, which has spread to Western Europe. It was recorded in Slovakia around 2007 (Oboňa et al. 2019). It also often sits on people, especially mushroom pickers, in the autumn (Oboňa et al. 2019), but so far no human bites have been recorded in Slovakia. The bite is known only from the native species *L. cervi* (Linnaeus, 1758) (Oboňa et al. 2024).

***Nezara viridula* (Linnaeus, 1758)**
Ordo: Hemiptera
Material examined: Požiarnícka ulica street (48°59'42.5"N 21°13'58.0"E), 17.9.2023, on *Vitis vinifera* L.
Comments: This is probably a species of Mediterranean or East African geographical origin (Horváth 1897). In Slovakia, this pest was first recorded in 2014 in Štúrovo (Vétek et al. 2014; Hemala & Kment 2017). Adults develop on more than 150 plant species (Smaniotto & Panizzi 2015; Panizzi & Lucini 2017; Hemala & Harman 2022).

***Oxycarenus lavaterae* (Fabricius, 1787)**
Ordo: Hemiptera
Material examined: Streets: Požiarnícka ulica (48°59'41.6"N 21°13'54.8"E), Fučíkova ulica (48°59'43.9"N 21°13'35.0"E) (Figure 4), 30.5.2023, on *Tilia platyphyllos* Scop.
Comments: Historically, this species was found mainly in the Mediterranean region, including North Africa, but from the 1970s it began to spread further north (Nedvěd et al. 2014). These stick bugs form large groups (aggregates) on the trunks and branches of trees to hibernate (Kalushkov 2000).

Figure 4. *Oxycarenus lavaterae* (Fabricius, 1787) from Fučíková street. Photo by S. K Tkáčová.

***Parectopa robiniella* (Clemens, 1863)**
Ordo: Lepidoptera
Material examined: 16.9.2023, near the Torysa River (48°59'13.7"N 21°14'11.9"E) on (Figure 5) *Robinia pseudoacacia* L.
Comments: This tiny butterfly comes from North America. It was first recorded in Europe in Switzerland in 1983 (Vakula et al. 2011). In Slovakia, this species was observed for the first time in 1987 (Turčáni et al. 2001; Rell et al. 2017). Caterpillars mine *Robinia* leaves, and in cases of overpopulation, this can cause the premature falling of the leaves at the end of summer (Kalivoda 2014).

Figure 5. *Parectopa robiniella* (Clemens, 1863) near the Torysa River. Photo by S. K Tkáčová.

Until recently, only 6 invasive species were known from the city of Prešov (Rell et al. 2017; Oboňa et al. 2016, 2017, 2019; Baranová et al. 2018; Čabanová et al. 2021). Thanks to the results presented here, this number has increased from the original 6 to 13 species.
This list of species is probably not complete because many insect species are constantly spreading and reaching non-native territories due to human influence. These species can quickly adapt to new conditions and cause serious damage (impact on native species, transmission of diseases, pathogens and pests) (Nevřelová & Becková 2015). Therefore, it is only a matter of time before other invasive animals are added to this list. It is also important to emphasize that we examined only a certain part of the Prešov city and not the whole city. Regular monitoring of invasive species is also important. There may still be several other species in the territory of Prešov, tied to, for example, nutritious plants that were found on inaccessible land or species that could simply have been overlooked.

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Review

Updated checklist of the Scatopsidae Newman, 1834 (Diptera) of the Czech Republic and Slovakia

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Abstract
The present checklist updates the one published in the *Checklist of Diptera of the Czech Republic and Slovakia, electronic version 2,* 2009. Since then, the number of species has increased by two in the Czech Republic (none in Bohemia and two in Moravia) and by three in Slovakia. The present list includes 48 species from the Czech Republic (41 from Bohemia and 44 from Moravia) and 46 from Slovakia. Relevant faunistic and systematic papers are listed.

Key words: dung midges, minute black scavenger flies, biodiversity, Central Europe, taxonomy

Introduction

The Scatopsidae are a medium-sized but still inadequately known family of derived nematocerous Diptera. Adults are minute to small midges ranging from 0.5 to 4.0 mm in length, generally dark in colour, sometimes more or less marked with yellow. Body rather strongly built, often quite elongated, with parallel-sided abdomen. Eyes holoptic, forming a characteristic supraantennal bridge. Antenna comparatively short, composed of two basal segments and a flagellum of 5–10 flagellomeres that are generally wider than long. Wing venation reduced, generally only anterior veins pigmented. Larvae flattened, with a complete cephalic capsule, peripneustic. All known larvae are saprophagous, living in a wide variety of media (rotten plants and fruits, rotten wood, under decaying bark of dead trees, soil, leaf litter, fungi, dung, etc.) (Haenni & Vaillant 1994). The adults may be found in nearly all kinds of biotopes, but more frequently in open, fresh and marshy areas.

The world fauna of Scatopsidae comprises some 380 species (Haenni & Amorim 2017), of which about 105 species in 22 genera are known in Europe (Haenni 2013a and unpubl. data).

The male and female genital characters enable safe identifications to be made. A key to the Palaearctic genera (both larvae and adults) may be found in Haenni (1997), where references to papers for identification to species level are also included. The former checklist (Haenni 2009b) included 46 species from the Czech Republic (41 from Bohemia and 42 from Moravia) and 43 from Slovakia.

Material and methods

The classification used here follows Amorim (1994) and Chandler (1998), while the nomenclature follows Haenni (2013a). The format of the checklist itself sticks as much as possible to the one in Haenni (2009b).

Results and Discussion

55 species are included in the present checklist: 48 from the Czech Republic (41 from Bohemia and 44 from Moravia) and 46 from Slovakia. The preceding electronic version of checklist (Haenni 2009a) was based upon the printed version of checklist (Martinovský 1997b), which was based itself mainly upon the important papers by Martinovský (1997a) for the Czech Republic and by Kozánek & Roller (1997) for Slovakia, complemented by a series of faunistic papers (Haenni & Barták 2000, 2006; Haenni et al. 2005; Martinovský 1998). Since the preceding electronic version of checklist (Haenni 2009a) the number of species has increased by 2 in the Czech Republic (none in Bohemia and 2 in Moravia) and by 3 in Slovakia. The few additional records may be found in the following recent revisional and faunistic papers (Ševčík 2010; Haenni 2013b; Haenni & Martinovský 2014; Haenni & Roháček 2021; Haenni et al. 2021; Oboňa et al. 2021; Beuk et al. 2023). The species richness of the scatopsid fauna is rather well known in the Czech Republic and in Slovakia, but the number of species will continue to grow as some new species are still awaiting description.

Checklist

New records are in bold, with relevant notes to be found at the end of the list.

ASPISTINAE	
Aspistes Meigen, 1818	
berolinensis Meigen, 1818	CZ (B M) SK
ECTAETIINAE	
Ectaetia Enderlein, 1912	
clavipes (Loew, 1846)	CZ (B M) SK
PSECTROSCIARINAE	
Anapausis Enderlein, 1912	
*albohalterat*a Duda, 1928	CZ (B M) SK
dufourella Haenni, 1984	CZ (M) SK
floricola Chandler, 1999	CZ (B M) **SK** [1]
haemorrhoidalis Duda, 1928	CZ (B M) SK

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helvetica Haenni, 1984	CZ (B M) SK
inermis (Ruthé, 1831)	CZ (B M) SK
nigripes (Zetterstedt, 1860)	CZ (B M)
rectinervis Duda, 1928	CZ (B M) SK
rohaceki Martinovský, 1997	SK
solmatina Haenni & Martinovský, 2014	**CZ** (**M** [2]) **SK** [2]
soluta (Loew, 1846)	CZ (B M) SK
talpae (Verrall, 1912)	CZ (B M) SK
SCATOPSINAE	
COLOBOSTEMATINI	
Colobostema Enderlein, 1926	
auberti Haenni, 2013	**SK** [3]
infumatum (Haliday, 1833)	CZ (B)
nigripenne (Meigen, 1830)	CZ (B M) SK
obscuritarse (Strobl, 1898)	CZ (M)
triste (Zetterstedt, 1850)	CZ (B M) SK
Efcookella Haenni, 1998	
albitarsis (Zetterstedt, 1850)	CZ (B M) SK
Ferneiella Cook, 1974	
brevifurca (Enderlein, 1912)	CZ (B)
incompleta (Verrall, 1886)	CZ (B M) SK
Holoplagia Enderlein, 1912	
bullata (Edwards, 1925)	CZ (B M) SK
lucifuga (Loew, 1870)	CZ (B M) SK
richardsi (Edwards, 1934)	CZ (M) SK
transversalis (Loew, 1846)	CZ (B M) SK
RHEGMOCLEMATINI	
Thripomorpha Enderlein, 1905	
bifida (Zilahy-Sebess, 1956)	CZ (B M) SK
freyi (Cook, 1969)	CZ (B M)
haennii Martinovský, 1997	SK
halteratum (Meigen, 1838)	CZ (B M) SK
paludicola Enderlein, 1905	CZ (B M) SK
verralli (Edwards, 1934)	CZ (B M) SK
SCATOPSINI	
Apiloscatopse Cook, 1974	
filamentosa (Duda, 1928)	CZ (M) SK
flavicollis (Meigen, 1818)	CZ (B M) SK
flavocincta (Duda, 1928)	CZ (B M)
gracilis (Duda, 1928)	CZ (B M) SK
mattheyi Haenni, 1981	CZ (M)
picea (Meigen, 1818)	CZ (B M) SK
scutellata (Loew, 1846)	CZ (B M) SK
styriaca (Enderlein, 1926)	SK
Pharsoreichertella Cook, 1974	
hamifera (Strobl, 1909)	CZ (B)
simplicinervis (Duda, 1928)	SK
Reichertella Enderlein, 1912	
geniculata (Zetterstedt, 1850)	CZ (B M) SK
nigra (Meigen, 1804)	CZ (B M) SK
pulicaria (Loew, 1846)	CZ (B M) SK
Scatopse Geoffroy, 1762	
lapponica Duda, 1928	CZ (B) SK
notata (Linnaeus, 1758)	CZ (B M) SK
SWAMMERDAMELLINI	
Coboldia Melander, 1916	
fuscipes (Meigen, 1830)	CZ (B M) SK
Rhexoza Enderlein, 1936	
subnitens (Verrall, 1886)	CZ (B M) SK
Swammerdamella Enderlein, 1912	
acuta Cook, 1956	CZ (B M) SK
adercotris Cook, 1972	CZ (B M) SK
brevicornis (Meigen, 1830)	CZ (B M) SK
genypodis Cook, 1972	SK
jindrichi Haenni, 2021	**CZ** (**M** [4])
pediculata (Duda, 1928)	SK

Notes:

[1)] First record from Slovakia published by Haenni et al. (2021).

[2)] Described from Switzerland, Czech Republic (Moravia) and Slovakia by Haenni & Martinovský (2014)

[3)] Described from Switzerland, Slovakia and other countries by Haenni (2013b)

[4)] Described from Czech Republic (Moravia) in Haenni & Roháček (2021)

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Review

Updated checklist of the Bibionidae Fleming, 1821 (Diptera) of the Czech Republic and Slovakia

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Abstract
The present checklist updates the ones published in the *Checklist of Diptera of the Czech Republic and Slovakia, electronic version 2* for families Bibionidae (Haenni & Bosák 2009) and Pleciidae (Bosák 2009), the latter being here reintegrated within Bibionidae. The number of species has increased by 1 in the Czech Republic (2 in Bohemia) and by 1 in Slovakia. The present list includes 21 species from the Czech Republic (20 from Bohemia and 20 from Moravia) and 21 from Slovakia. Relevant faunistic and systematic papers are listed.

Key words: march flies, biodiversity, Central Europe

Introduction

The family Bibionidae is presently divided into four subfamilies: Hesperininae, Pleciinae, Penthetriinae and Bibioninae (Fitzgerald 2004, 2009). In the Czech Republic and Slovakia, the family is represented by two subfamilies: Bibioninae with genera *Dilophus* and *Bibio* (Haenni & Bosák 2009) and Penthetriinae with genus *Penthetria,* which was placed in the separate family Pleciidae in former versions of the checklist (Bosák 2009).

Bibioninae are small to large (3.0-15.0 mm) nematocerous flies with a strong sexual dimorphism that is evident in both the morphology (eyes holoptic in males, broadly separated in females) and the colour. Bibionids are robust flies with setose body, swollen fore femur, and fore tibia armed with series of spines (*Dilophus*) or strong apical spurs (*Bibio*). Antenna short with transverse antennomeres. Palpus four-segmented, longer than antenna. Wing with anterior veins darkened and posterior ones usually depigmented, basal radial and basal medial cells long, and Rs unforked. The phytosaprophagous larvae develop in decaying vegetable matter or leaf litter, and some species may become pests of crops while feeding on the roots of grasses and subterranean parts of plants. Penthetriinae are rather large flies, with elongate legs. Fore leg normal, with femur not swollen and tibia devoid of spines or enlarged apical spurs. Antennomeres short, hardly longer than wide. Palpus long, four-segmented. Wing darkened, without distinct stigma, all veins uniformly pigmented, vein Rs forked. Wings reduced in male of the European species.

The Bibioninae comprise about 420 world species, of which about 45 species occur in Europe (Skartveit 2013). Approximately 32 species of Penthetriinae are known worldwide. In Europe, the subfamily is represented by only one indigenous, widely distributed species, *Penthetria funebris* Meigen, 1804 (Skartveit 2013). A North American species, *Penthetria heteroptera* (Say, 1823), was recorded once from Germany (Fitzgerald & Werner 2004), probably imported with garden soil or compost, but it has never been reported again from Europe.

The combined former checklist [Bibionidae + Pleciidae] (Haenni & Bosák 2009; Bosák 2009) included 21 [20+1] species from the Czech Republic, 18 [17+1] from Bohemia and 20 [19+1] from Moravia), and 19 [18+1] from Slovakia.

Material and methods

The classification used here follows Fitzgerald (2004, 2009) while the nomenclature follows *Fauna Europaea* – Skartveit (2013). The format of the checklist itself sticks as much as possible to the one in Haenni & Bosák (2009).

Results and Discussion

22 species are included in the present checklist: 21 from the Czech Republic (20 from Bohemia and 20 from Moravia) and 21 from Slovakia. The preceding electronic version of the checklist (Haenni & Bosák 2009) was based upon the printed version of the checklist (Pecina 1997) completed by recent faunistic papers (Haenni et al 2005, Bosák & Haenni 2006). A strictly boreal species, *Bibio rufipes* (Zetterstedt, 1838) was listed as doubtful in the first version of the checklist (Pecina 1987) but correctly omitted in subsequent versions. The only changes since the last version of the checklist (Haenni & Bosák 2009) are the new records of one species from Slovakia (Mantič et al. 2015) and Bohemia (Dvořák 2017), of another species for the Czech Republic and Bohemia (Skartveit 2017) and a nomenclatural change due to synonymy. Additional faunistic papers have been published (Oboňa et al. 2021; Beuk et al. 2023). In conclusion, the species richness of the bibionid fauna is well known in the Czech Republic and Slovakia, although one additional species recorded from Hungary, *B. handlirschi* Duda, 1930 (Papp & Haenni 2007), might possibly also occur.

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Checklist

New records and nomenclatural changes are in bold, with relevant notes to be found at the end of the list.

BIBIONINAE	
Bibio Geoffroy, 1762	
brunnipes (Fabricius, 1794)	**SK** [1]
clavipes Meigen, 1818	CZ (B M) SK
femoralis Meigen, 1838	CZ (B M) SK
ferruginatus (Linnaeus, 1767)	CZ (B M) SK
hortulanus (Linnaeus, 1758)	CZ (B M) SK
johannis (Linnaeus, 1767)	CZ (B M) SK
lanigerus Meigen, 1818	CZ (B M) SK
lautaretensis Villeneuve, 1924	CZ (M) **SK** [2]
leucopterus Meigen, 1804	CZ (B M) SK
marci (Linnaeus, 1758)	CZ (B M) SK
nigriventris Haliday, 1833	CZ (B M) SK
pomonae (Fabricius, 1775)	CZ (B M) SK
reticulatus Loew, 1846	CZ (B M) SK
varipes Meigen, 1830	CZ (B M) SK
venosus (Meigen, 1804)	CZ (B M) SK
villosus Meigen, 1818	**CZ** [3] (**B** [3])
Dilophus Meigen, 1803	
bispinosus Lundström, 1913	CZ (**B** [4] M) **SK** [5]
febrilis (Linnaeus, 1758)	CZ (B M) SK
femoratus Meigen, 1804	CZ (B M) SK
humeralis Zetterstedt, 1850	CZ (B M) SK
neglectus Haenni, 1982	CZ (B M) SK
PENTHETRIINAE	
Penthetria Meigen, 1803	
funebris Meigen, 1803	CZ (B M) SK

Notes:

[1)] In previous checklists under the name *B. fulvipes* (Zetterstedt, 1838) (synonymy by Fitzgerald & Skartveit (1997)).

[2)] Erroneously omitted from Slovakia in the preceding checklist (Haenni & Bosák 2009), although correctly recorded in previous version of the checklist (Pecina 1997).

[3)] First record from Bohemia of this long forgotten species of controversial identity published by Skartveit (2017).

[4)] First record from Bohemia published by Dvořák (2017).

[5)] First record from Slovakia published by Mantič et al. (2015).

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