

## 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<sup>2</sup>. 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, Rtně v Podkrkonoší, Hronov, and Žďárky – the northern part is limited by the wavy frontier of Poland. The general natural history of the whole studied area was characterized, e.g., briefly by Vitek (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) – Petřikovice (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 Stołowe, 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), Kviřte (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)

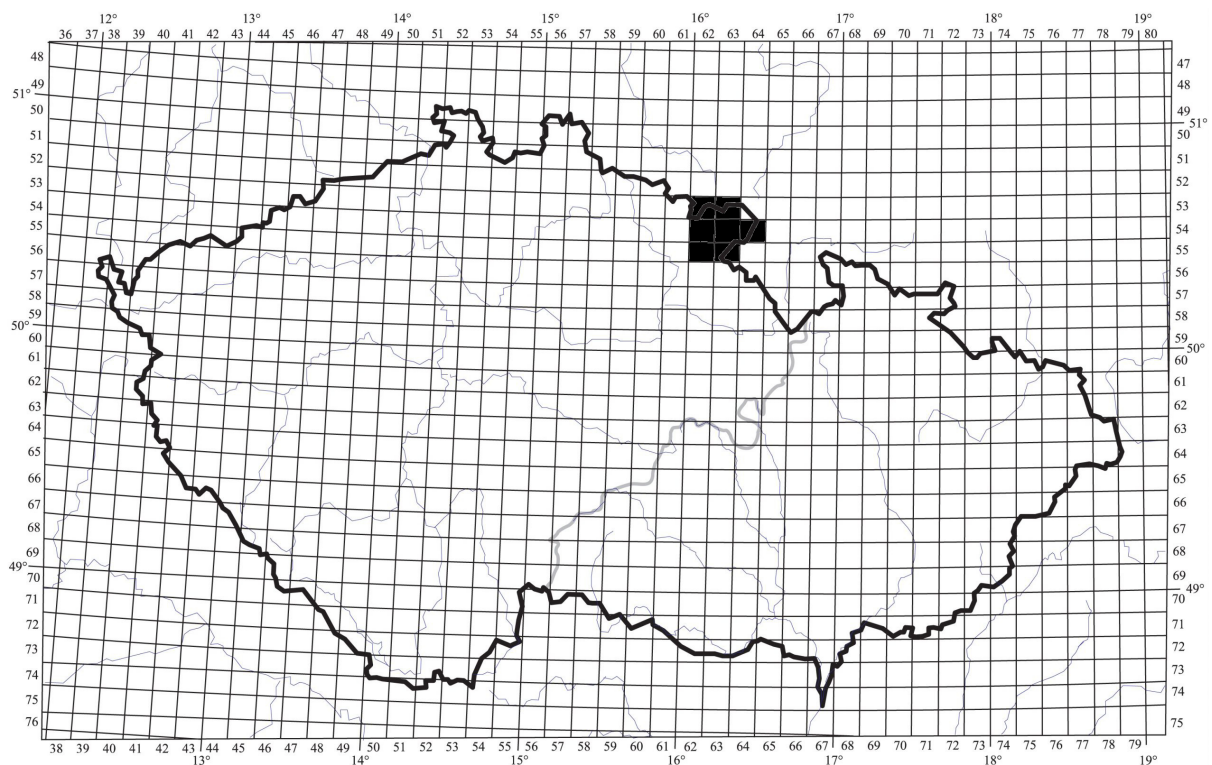


Figure 2. Map of faunistic squares in the Czech Republic. Created by Jozef Oboňa.

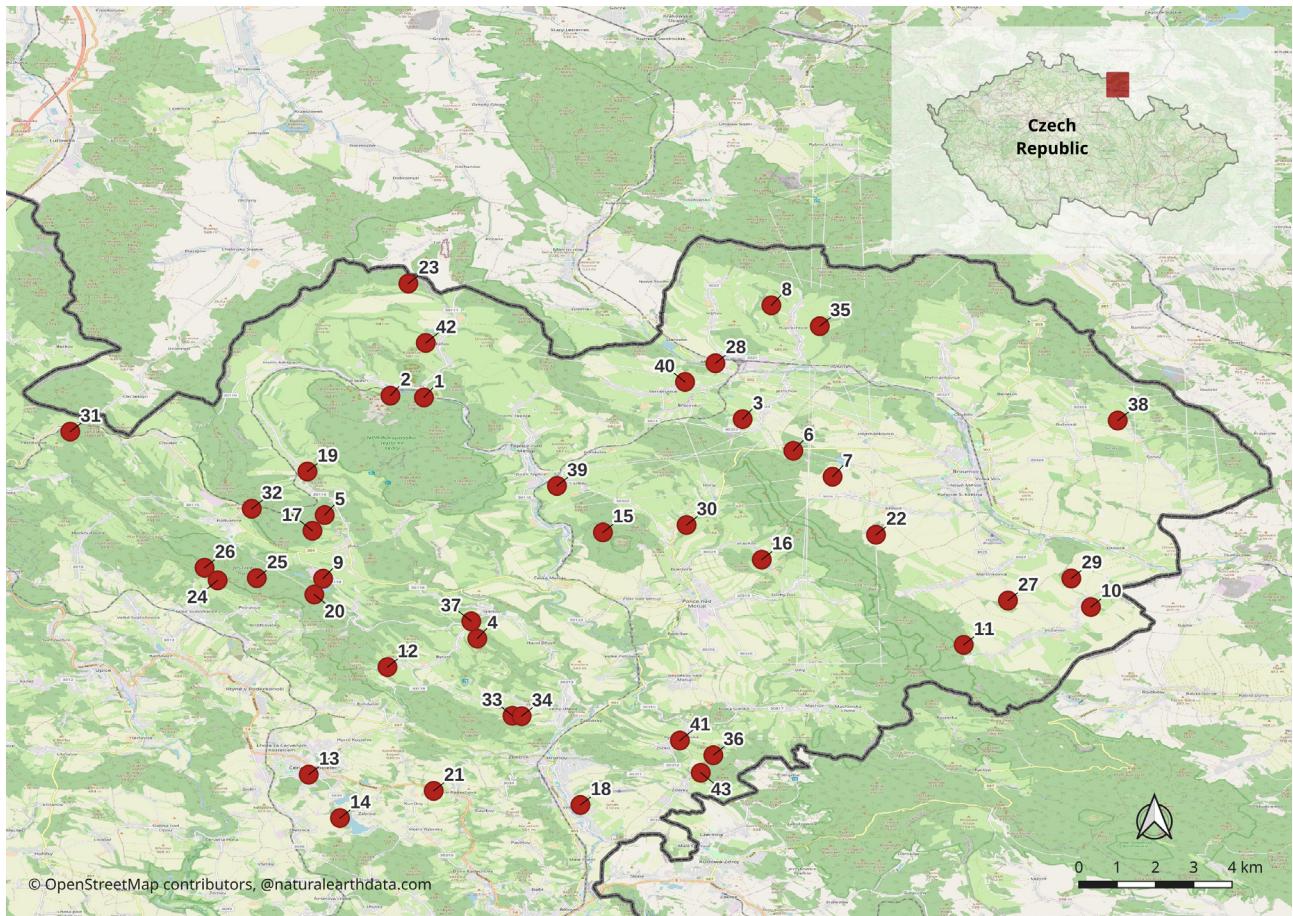


Figure 3. Map of the study area with sites 1 – 43. Prepared by Jana Michalková.

**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 cupriferos 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 Verněřovice**, 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 stráž 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. Verněřovice env. Meziměstí**, Verněřovická 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 Růžicková.



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 Růžicková.



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 4m. 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 nematoceros 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 Růžicková.



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 Růžicková.



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 Růžicková.

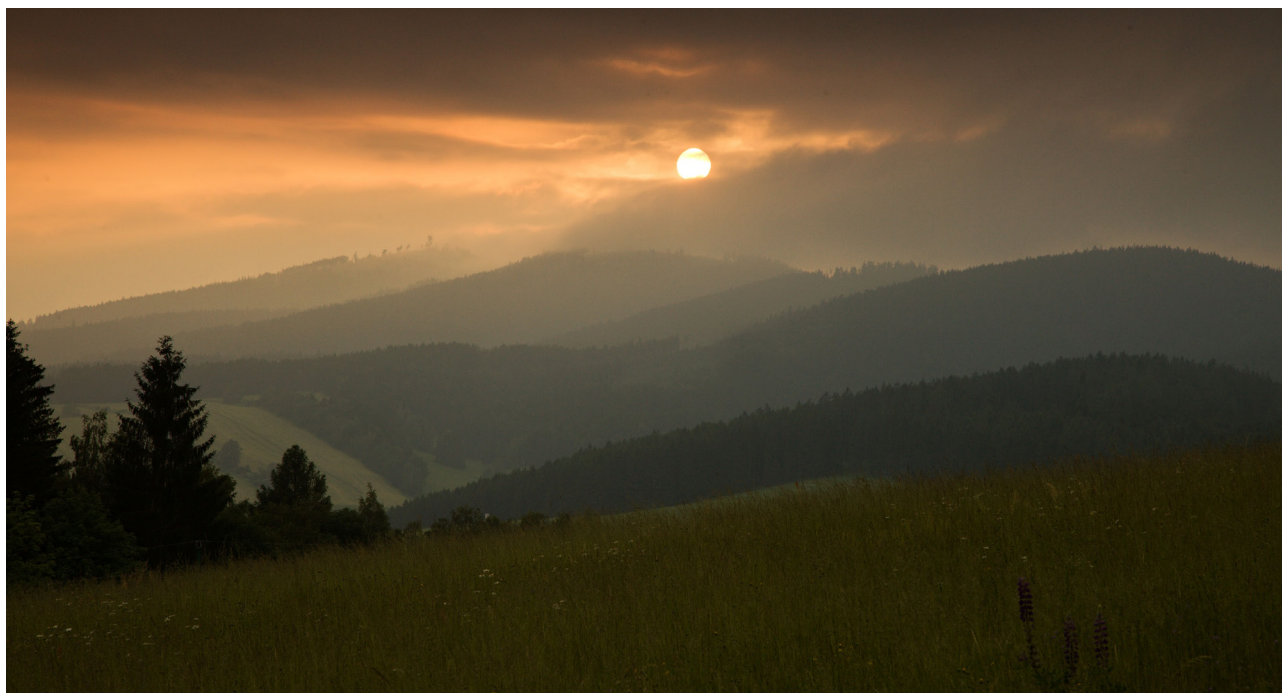


Figure 17. Dark backdrops of ridges of Javoří hory hills in foggy haze with a combination of clouds of proceeding rain front during nightfall (view from Janovičky). Photo by Zuzana Růžičková.

## 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 Stárvkov (4), ♂, 15.8.1997, J, INS 7309. Between Janovice and Horní Verněřovice (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. Verněřovice 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 Stárvkov (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, Špínka 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. Stárvkov (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. Stárvkov (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; Kvitte 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. Rтынě 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 griseescens* (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. Rtně 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 crispis* (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 countries, 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. Kostecké 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	<i>incurvus</i> (EN), <i>trivialis</i> , <i>rotunda</i> (CR)
2	Dolní Adršpach	<i>incurvus</i> (EN), <i>manicata</i> , <i>subneglecta</i> , <i>fallax</i> , <i>trivialis</i>
3	Between Březová and Jetřichov	<i>ocellaris</i> , <i>trivialis</i>
4	Between Bystré and Stárkov	<i>lucifugus</i> , <i>silvaticus</i> (VU), <i>satchelli</i> , <i>cognata</i>
5	Between Janovice and Horní Vernéřovice	<i>polyascoidea</i> , <i>lucifugus</i> , <i>ocellaris</i> , <i>trivialis</i> , <i>a. annulata</i> , <i>cognata</i> , <i>fuliginosa</i>
6	Between Křinice and Hejtmánkovice, Lesní školky forest nursery	<i>ocellaris</i> , <i>trivialis</i>
7	Between Křinice and Hejtmánkovice, Šlégl pond	<i>longicornis</i> , <i>polyascoidea</i> , <i>trivialis</i>
8	Between Pomeznice and Ruprechtice	<i>auriculata</i> , <i>phalaenoides</i> , <i>trinodulosa</i> , <i>ocellaris</i> , <i>rivosus</i> (CR), <i>trivialis</i> , <i>pulchra</i> , <i>a. annulata</i> , <i>fuliginosa</i>



Table 1. Continued.

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

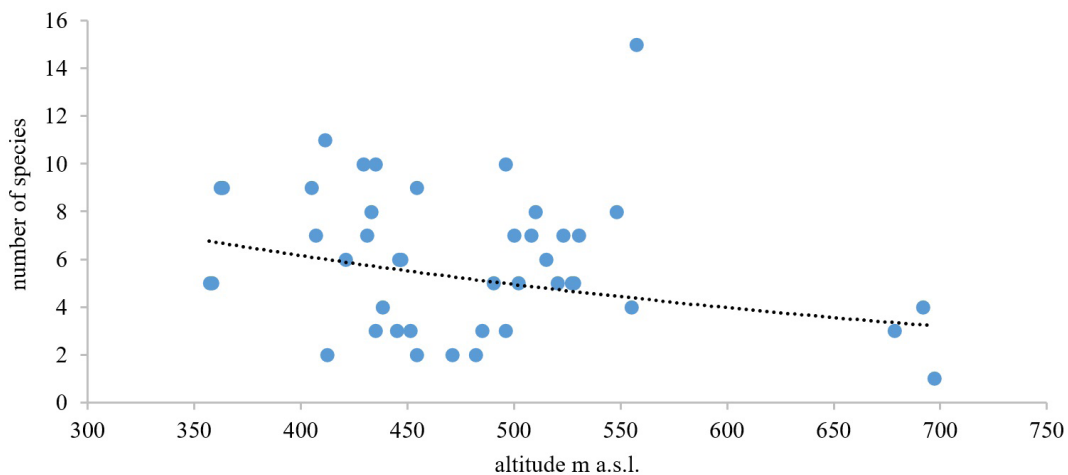


Figure 18. Altitude and the number of species of moth flies at sampling sites, with an exponential trend line (created by Jozef Oboňa).

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).

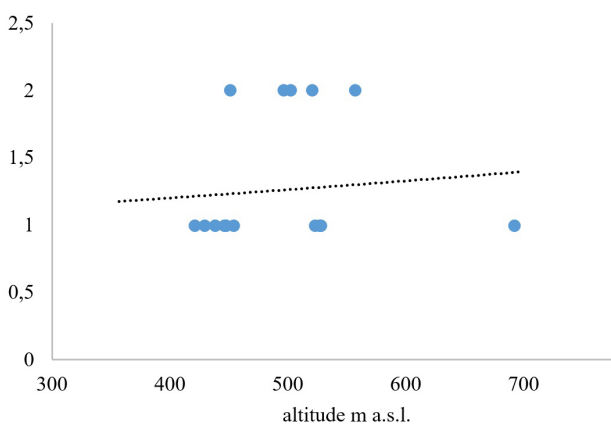


Figure 19. Altitude and the number of species with conservation potential of moth flies at sampling sites, with an exponential trend line (created by Jozef Oboňa).

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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