

Opomyzoid families – Clusiidae, Opomyzidae, Anthomyzidae, Aulacigastridae, Perisclididae, Stenomicridae and Asteiidae (Diptera: Acalyprata) of the Jizerské hory Mts, Frýdlant region and Liberec environs (northern Bohemia, Czech Republic)

Opomyzoidní čeledi – Clusiidae, Opomyzidae, Anthomyzidae, Aulacigastridae, Perisclididae, Stenomicridae a Asteiidae (Diptera: Acalyprata) Jizerských hor, Frýdlantska a okolí Liberce (severní Čechy)

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Abstract. A total of 44 species of Diptera Acalyprata have been ascertained in the Jizerské hory Mts, Frýdlant region and Liberec environs, belonging to 7 families of Opomyzoidea, viz. Clusiidae (8 species, i.e. 72.7% of all species known from the Czech Republic and 72.7% of species known from Bohemia respectively), Opomyzidae (9 species, 45% and 47.4%), Anthomyzidae (18 species, 90% and 94.7%), Aulacigastridae (2 species, 66.7% and 66.7%), Perisclididae (1 species, 33.3% and 33.3%), Stenomicridae (2 species, 66.7% and 66.7%) and Asteiidae (4 species, 44.4% and 50%). Eleven of the recorded species are considered threatened (3 EN, 8 VU) in the Czech Republic. The most interesting and important (due to rarity or jeopardy) are *Clusiodes caledonicus* (Collin, 1912) and *Heteromeriingia nigrimana* (Loew, 1864) (Clusiidae), *Opomyza lineatopunctata* von Roser, 1840 and *O. punctata* Haliday, 1833 (Opomyzidae), *Anagnota major* Roháček & Freidberg, 1993, *Anthomyza paraneglecta* Elberg, 1968, *Arganthomyza socculata* (Zetterstedt, 1847) and *Stiphrosoma cingulatum* (Haliday, 1855) (Anthomyzidae), *Podocera soniae* (Merz & Roháček, 2005) and *Stenomicra cogani* Irwin, 1982 (Stenomicridae) and *Asteia elegantula* Zetterstedt, 1847 (Asteiidae). The remarkably high species-richness of Anthomyzidae indicates the area has an abundance of marshland habitats very suitable to members of this family.

Key words: Diptera, Clusiidae, Opomyzidae, Anthomyzidae, Aulacigastridae, Perisclididae, Stenomicridae, Asteiidae, Jizerské hory Mts, Frýdlantská pahorkatina Hills, Liberecká kotlina Basin, Czech Republic, biodiversity, faunistics, threatened species

INTRODUCTION

This is a further contribution to the knowledge of the biodiversity of Diptera in the Jizerské hory Mts and adjacent Frýdlant region (in the north) and Liberec environs (in the south) (Czech Republic: northern Bohemia). It is devoted to seven families of the superfamily Opomyzoidea, viz. Clusiidae, Opomyzidae, Anthomyzidae, Aulacigastridae, Perisclididae, Stenomicridae and Asteiidae. Most of these families have not been studied from the biodiversity point of view in this area; only Clusiidae and Aulacigastridae were processed by Máca (2009a) but because of a number of additional recently obtained data they are also included in the present treatment.

The faunal survey presented below is based (1) on material obtained by P. Vonička and J. Preisler during their field work in 2002–2017 and (2) on specimens collected by J. Roháček and some other dipterists during one-week expeditions performed every year from 2011 to 2017 and (3) previously published records. Brief characteristics of the families are given under their treatments including all formerly published faunal data and followed by a survey of all recorded species with literary and new records and concise distributional and biological remarks. The biodiversity of these families in the study area is discussed as is also the presence of threatened species.

DESCRIPTION OF THE STUDY AREA

The study area comprises the Jizerské hory Mts (Protected Landscape Area) and two adjacent areas, the Frýdlant region in the north and the environs of the Liberec city in the south (Liberecká kotlina Basin). Geographically, it belongs to the Krkonoše-Jeseníky montane system and the Krkonoše Mts subsystem (Demek 1987). It is composed of the geomorphological complexes and/or subcomplexes of the Jizerské hory Mts, Frýdlantská pahorkatina Hills, Žitavská kotlina Basin and Ještědsko-Kozákovský hřbet Ridge. The surveyed territory is altitudinally diverse, ranging from the highest elevation on the top of Smrk Mt. (1124 m) in the Jizerské hory Mts to the lowest one at the Smědá river on the Czech-Polish boundary in the Frýdlant region (208 m).

Geologically, the area under study belongs to the Lugicum area, which forms the north-eastern part of the Bohemian Massif. The Jizerské hory Mts are a part of the Krkonoše-Jizerské hory crystalline complex, in the surveyed area composed of the Jizera gneiss complex and the Variscan Krkonoše-Jizerské hory granite massif (Chaloupský 1989). The Frýdlantská pahorkatina Hills is a part of the Lužice Massif, formed of Cadomian granitoids. The prevailing part of the Ještědský hřbet Ridge belongs to the Ještěd crystalline complex. Along the Smědá river in the Frýdlant region and in the Liberecká kotlina Basin, Tertiary fresh-water sediments have been preserved. In the south-western part of the Frýdlantská pahorkatina Hills and sporadically in the Jizerské hory Mts, solitary Tertiary basaltic knobs protrude. In the Frýdlant region, Quaternary sediments (loess earth and glacial sediments) are represented. At higher altitudes in the Jizerské hory Mts, organic sediments (peat) occur.

The climate of the study area is significantly affected by the fact that the Jizerské hory Mts are situated on the windward side towards the prevailing western winds. They create a barrier to the moist and cold air currents from the Atlantic ocean, which results in high rainfall and snow cover. The total amount of precipitation in the Frýdlantská pahorkatina Hills and Liberecká kotlina basin is about 900 mm, in the warmer western part of the Frýdlant region 800 and in the eastern moist part almost 1000 mm. The Jizerské hory Mts are situated in a cold climatic region. The average annual temperature falls below 5 °C, in higher altitudes below 4 °C. The average annual temperature in the Frýdlant region ranges from 7 to 8.5 °C, in the Liberecká kotlina Basin it is about 7 °C (Quitt 1971).

The rivers of the study area flow to the North and Baltic Seas. Many watercourses rise in the Jizerské hory Mts. The Lužická Nisa drains waters from the northern and western parts of the Jizerské hory Mts to the Odra (Oder) river and to the Baltic Sea; the most important tributary of the Lužická Nisa is the Smědá river in the Frýdlant region. The Jizera is the most significant

river which drains waters from the southern and eastern parts of the Jizerské hory Mts to the Labe (Elbe) river and the North Sea; an important tributary of the Jizera is the Kamenice river. In the Jizerské hory Mts there are several artificial water reservoirs. In the Frýdlant region, several ponds can be found; the largest of them is the Dubák pond near Černousy. Natural water bodies occur in the Jizerské hory Mts – small pools in the raised peat-bogs.

From the phytogeographical point of view the study area belongs largely to Oreophyticum, district no. 92. Jizerské hory Mts, in the southeastern part district no. 93. Krkonoše Mts. The lower altitudes belong to Mesophyticum, districts nos. 48. Lužická kotlina Basin, 49. Frýdlantská pahorkatina Hills and 54. Ještědský hřbet Ridge (Skalický 1988). Except for the southern foothills, the Jizerské hory Mts are almost continuously forested. Modified by long-term forest management, the originally predominant beech forests were substituted by spruce wood. Remnants of beech forests have been preserved on the northern and northwestern slopes of the Jizerské hory Mts only. Original mixed forests were significantly changed, silver fir became almost extinct and even the native spruce declined markedly. Except for small fragments, original mountane spruce woods were not preserved. The forests in the central part of the mountains were destroyed during the ecological disaster resulting from high air pollution load and larch tortrix and bark beetle outbreaks in the 1970–90s. Damaged spruce stands were preserved in protected areas (nature reserves) only. Extensive clearcuts were reforested mostly with spruce (*Picea excelsa*), partly with introduced exotic species of spruce and pine (*Picea pungens*, *Pinus* spp.). At present, the central part of the mountains is covered by young spruce stands under 40 years of age. Peat-bog ecosystems are the most valuable natural sites in the central part of the Jizerské hory Mts. They are represented by many peat bogs differing in size and quality. Mesophilic and hydrophilic meadows are present near the southern border of the mountains; the most valuable of them are developed in the Malá Strana and Bukovec Nature Reserves and in the Tichá říčka Natural Monument.

A major part of the Frýdlant region is covered by farmland. Besides arable land there are large areas of cultural meadows and pastures. Near-natural grasslands are found mostly in the floodplain of the Smědá river. Diverse aquatic and wetland plant communities are developed near ponds in the whole area, most significantly near the Dubák pond. Cultural meadows and pastures occur throughout the region. The forests in the Frýdlant region are mostly cultivated. Spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*) predominate in the species composition, near-natural components include the sessile oak (*Quercus petraea*) and pedunculate oak (*Q. robur*), beech (*Fagus sylvatica*), small-leaved lime (*Tilia cordata*) and hornbeam (*Carpinus betulus*).

Much of the Liberecká kotlina Basin is urbanized, other large areas are arable lands and cultural grasslands. Relatively near-natural vegetation is preserved in small areas. Forests are notably modified by forest management; small near-natural stands are preserved on the slopes in the valleys. Mesophilic and hydrophilic meadows and wetlands are important non-forest communities.

MATERIAL AND METHODS

List of localities

Data are presented in the following order: locality name, usually the name of the nearest municipality; geomorphological complex; grid mapping square code; altitude; specified location; habitat type (where appropriate). The localities are listed alphabetically.

- [1] **Albrechtice v Jizerských horách:** Jizerské hory Mts, 5257, 800 m, spruce forest.
- [2] **Bílý Kostel nad Nisou:** Ještědský hřbet Ridge, 5256, Křížový potok valley, 350–500 m, mixed forest.
- [3] **Bílý Potok:** Jizerské hory Mts, 5157, 430–470 m, small ponds, spring area, meadows, beech forest.
- [4] **Bohuňovsko:** part of Jesenný, Železnobrodská vrchovina Highlands, 5357, 310–330 m, Kamenice river.
- [5] **Bukovec NR:** Jizerské hory Mts, 5158, Bukovec Mt. (1005 m), 900–1005 m, deciduous forest, damp and mountain meadows, spring area, quarry.
- [6] **Fojtecký mokřad NM:** Jizerské hory Mts, 5156, 370 m, wetland.
- [7] **Frýdlant:** Frýdlantská pahorkatina Hills, 5056, 300–320 m, Smědá river.
- [8] **Heřmanice:** Frýdlantská pahorkatina Hills, 5056, Kodešův vrch Hill, 330 m, basalt quarry.
- [9] **Holubník Mt.:** Jizerské hory Mts, 5157, 900 m, Bílé bukovi beech forest.
- [10] **Horní Lučany:** part of Lučany nad Nisou, Jizerské hory Mts, 5257, 670 m, Křisák pond.
- [11] **Horní Řasnice:** Frýdlantská pahorkatina Hills, 5057, Kamenný vrch Hill, 400 m, sand pit.
- [12] **Jedlový důl NR:** Jizerské hory Mts, 5257, Jedlová stream, 650–800 m, mixed forest.
- [13] **Jizerka:** part of Kořenov, Jizerské hory Mts, 5158, 850–900 m, mountain and damp meadows.
- [14] **Jizerskohorské bučiny NNR:** Jizerské hory Mts, 5156–5157, 500–850 m; Poledník Mt. (864 m, beech forest), Špičák Mt. (724 m, beech and mixed forest), Štolpichy valley (stream, beech forest), Velký Štolpich waterfall (800 m, beech forest), Viničná cesta path (500 m, beech forest).
- [15] **Kořenov:** Jizerské hory Mts, 5258, Martinské údolí valley, 640 m, Jizera river.
- [16] **Krásná Studánka:** part of Liberec, Liberecká kotlina Basin, 5156, 380 m, wetland, stream.
- [17] **Kunratice:** Frýdlantská pahorkatina Hills, 5056, 300 m, pasture and wetland.
- [18] **Ludvíkov pod Smrkem:** part of Nové Město pod Smrkem, Frýdlantská pahorkatina Hills, 5057, 1.7 km NW, 390 m, Lomnice stream, wetland, damp meadow, alder grove.
- [19] **Malá Strana NR:** Jizerské hory Mts, 5257, 700–720 m, damp meadow, wetland, stream, pond.
- [20] **Meandry Smědé NR:** Frýdlantská pahorkatina Hills, 5056, 220 m, Dubák pond, Smědá river, alder grove, damp meadow, wetland.
- [21] **Minkovice:** part of Višňová, Frýdlantská pahorkatina Hills, 5056, 250 m, wetland, stream.
- [22] **Mníšek:** Jizerské hory Mts, 5156, 380–430 m, meadows.
- [23] **Mšeno nad Nisou:** part of Jablonec nad Nisou, Jizerské hory Mts, 5257, 500 m, wetland, spring area.
- [24] **Nová louka NR:** Jizerské hory Mts, 5156–5157, 770 m, peat bog, spruce forest, Blatný potok stream.
- [25] **Oldřichov v Hájích:** Jizerské hory Mts, 5156, 400 m, meadows.
- [26] **Paseky nad Jizerou:** Jizerské hory Mts, 5258, 570 m, Makovský potok stream.
- [27] **Pertoltice:** Frýdlantská pahorkatina Hills, 5056, 280 m, Panenský rybník pond.
- [28] **Plavy:** Jizerské hory Mts, 5257, 400 m, Prubský potok stream.
- [29] **Poustecká obora:** game reserve, Frýdlantská pahorkatina Hills, 5056, 270 m, mixed forest, pond.
- [30] **Rašeliniště Jizerky NNR:** Jizerské hory Mts, 5157–5158, 850–870 m, peat bog, spruce forest, damp meadow, Jizerka stream.
- [31] **Rašeliniště Jizery NNR:** Jizerské hory Mts, 5157–5158, 830–870 m, peat bog, spruce forest, damp meadow, Jizera river.
- [32] **Rejdice:** part of Kořenov, Jizerské hory Mts, 5258, 650 m, Ješkrabec stream, spring area, wetland.
- [33] **Rudolfov:** part of Liberec, Jizerské hory Mts, 5256, 650 m, Černá Nisa stream, mixed forest.
- [34] **Smědava:** mountain chalet, part of Bílý Potok, Jizerské hory Mts, 5157, 830–888 m.
- [35] **Smrk Mt.:** Jizerské hory Mts, 5157, 1050–1124 m, spruce forest, young spruce trees.
- [36] **Šolcův rybník pond:** Jizerské hory Mts, 5156, S of Raspenava, 350 m, wetland, alder grove, Holubí potok stream.
- [37] **Tanvald:** Jizerské hory Mts, 5257, 0.7 km NE, 475 m, mixed forest, banks of Desná river.
- [38] **Tichá říčka NM:** Jizerské hory Mts, 5257, 770 m, damp meadow, mire.
- [39] **Torfowiska Doliny Izery Rezerwat:** Poland, Jizerské hory Mts, 5158, 830 m, former Wielka Izera, damp meadow.
- [40] **Uhelná:** part of Hrádek nad Nisou, Hrádecká pánev Basin, 5155, 280 m, sand-pit.
- [41] **Vesec:** part of Liberec, Liberecká kotlina Basin, 5256, 360 m, Luční potok stream, wetland.
- [42] **Vratislavice nad Nisou:** part of Liberec, Liberecká kotlina Basin, 5256, 370 m.
- [43] **Zadní kopec Mt.:** Jizerské hory Mts, 5157, 900 m, clearcut, spruce forest.

Collecting methods and material

The material was obtained using the following collecting methods: Malaise traps, protein traps, yellow pan traps, pitfall traps (these methods are described in detail e. g. by Vonička 2008), sweeping over vegetation and various substrates, individual netting, sifting decayed vegetation and individual collecting by aspirator under tufts of graminoid plants etc.

The majority of the material examined was collected by J. Preisler, J. Roháček and P. Vonička in the years 2003–2017. Selection of the material from the traps and its preparation were done by J. Preisler. The preserved (dry mounted or in ethanol) material was identified by J. Roháček (most specimens) and J. W. van Zuijlen (specimens of *Geomyza*). Voucher specimens are deposited in the North Bohemian Museum in Liberec (SMLC), the Silesian Museum in Opava (SMOC) and in the private collection of M. Barták, Praha (MBP).

Abbreviations used

RL– category of jeopardy according to Red list of threatened species in the Czech Republic. Invertebrates (see Martinek & Barták 2005; Roháček 2005a–d): **EN** – endangered species, **VU** – vulnerable species.

Protected areas: **NNR** – National Nature Reserve, **NR** – Nature Reserve, **NM** – Nature Monument.

Traps: **MT** – Malaise trap, **PT** – protein trap, **PYT** – pyramidal trap, **YPT** – yellow pan trap.

Collectors: **JP** – Jiří Preisler, **JR** – Jindřich Roháček, **PV** – Pavel Vonička.

Collections: **MBP** – Miroslav Barták (Praha) collection, **NMPC** – National Museum (Praha) collection; **SMOC** – Silesian Museum (Opava) collection, **SMLC** – North Bohemian Museum (Liberec) collection

RESULTS

Clusiidae

This small family includes only 14 species from Europe and adjacent island areas (Roháček & Merz 2017), 11 of which are known from the Czech Republic (all also from Bohemia), see Roháček (2009c). Species of Clusiidae are associated with forested areas, particularly those with a rich supply of fallen tree trunks and stumps because their saproxylic larvae develop in rotten wood. Adults can be usually seen on dead tree trunks or logs but can be also obtained by Malaise traps. First data about Clusiidae in the study area were published by Máca (2009a) who presented results of field work by P. Vonička and J. Preisler in the years 2003–2007 and recorded altogether 7 species. The records listed below are based on material obtained by subsequent research in the area and should be considered a supplement to the knowledge of the local fauna of Clusiidae. Adding one more species (*Heteromeriingia nigrimana*), a total of 8 species of Clusiidae are now known from the territory under study.

Clusia flava (Meigen, 1830)

Lit.: Bulovka (Máca 2009a).

Palaearctic species, common in various types of forests (including coniferous) in Central Europe including the Czech Republic.

Bukovec NR [5]: Pralouka, 50°48'40"N 15°21'21"E, damp meadow, 900 m, MT, 2.–21.vii.2010, 1 ♂, 1 ♀, PV lgt. (SMLC); 21.vii.–6.viii.2010, 1 ♀, PV lgt. (MBP); 50°48'38"N, 15°21'22"E, 895 m, on rotting fallen spruce trunks, 16.vii.2015, 1 ♂, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: alder grove, MT, 20.vii.–16.viii.2016, 1 ♀, PV lgt. (SMLC). **Malá Strana NR [19]**: 50°45'58"N, 15°12'04"E, 715 m, netted above fallen birch trunks, 15.vii.2015, 1 ♂, JR lgt. (SMOC). **Meandry Smědě NR [20]**: Černousy, 0.9 km SW, nr. Dubák pond, 50°59'49"N, 15°02'39"E, 240 m, on rotting tree trunks, 16.vi.2011, 1 ♂, JR lgt. (SMOC); Černousy-V Poli, alder grove, MT, 16.v.–12.vi.2012, 1 ♀, JP & PV lgt. (SMLC); Filipovka env., 50°59'06"N, 15°01'38"E, 225 m, sweeping undergrowth of deciduous forest, 14.vi.2011, 1 ♂, JR lgt. (SMOC).

Clusia tigrina (Fallén, 1820) (Fig. 1)

RL: VU

Lit.: Rejdice (Máca 2009a, as *Paraclusia*).

A European species (formerly treated in *Paraclusia*, synonymized with *Clusia* by Lonsdale & Marshall 2008) preferentially associated with large dead stumps of beech, elm or oak trees in old forests (Fig. 2). Second and third locality (and specimen) from the area under study.

Bílý Potok [3]: Velká Rybí voda stream, PT, 13.vii.–2.viii.2006, 1 ♀, JP & PV lgt. (SMLC). **Jizerskohorské bučiny NNR [14]**: Štolpichy valley, 1.5 km SE of Ferdinandov, 50°51'28"N, 15°11'11"E, 630 m, sweeping undergrowth of beech forest, 22.vii.2013, 1 ♀, JR lgt. (SMOC).

Clusiodes albimanus (Meigen, 1830)

Lit.: Horní Pertoltice (Máca 2009a).

A very common European species occurring in forests of various composition from lowlands to mountains.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping undergrowth of deciduous forest, 1.vi.2017, 1 ♂, JR lgt. (SMOC). **Bukovec NR [5]**: Pralouka, 50°48'40"N 15°21'21"E, 900 m, damp meadow, PT, 2.–21.vii.2010, 1 ♀, PV lgt. (MBP); mixed forest, MT, 31.v.–23.vii.2017, 1 ♀, M. Tkoč & JP lgt. (SMLC). **Holubník Mt. [9]**: 50°50'01"N 15°10'46"E, PYT, 11.v.–16.vi.2011, 1 ♂, 16.vi.–14.vii.2011, 1 ♂; MT, 14.vii.–24.viii.2011, 1 ♂, PV lgt. (MBP). **Jizerskohorské bučiny NNR [14]**: Poledník Mt., 50°51'18"N, 15°08'48"E, 835 m, on rotting beech trunks, 15.vi.2011, 2 ♂♂, 1 ♀, JR lgt. (SMOC); Štolpichy valley, 1.5 km SE of Ferdinandov, 50°51'28"N, 15°11'11"E, 630 m, sweeping undergrowth of beech forest, 15.vi.2012, 1 ♂, 22.vii.2013, 1 ♀, JR lgt. (SMOC); Velký Štolpich waterfall, 50°51'06"N, 15°11'26"E, 750 m, sweeping undergrowth of mixed forest, 15.vi.2011, 1 ♂, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: alder grove, MT, 20.vii.–16.viii.2016, 1 ♂, 16.viii.–13.ix.2016, 3 ♂♂, all PV lgt. (SMLC). **Meandry Smědé NR [20]**: Černousy, 0.9 km SW, nr. Dubák pond, 50°59'49"N, 15°02'39"E, 240 m, on rotting tree trunks, 16.vi.2011, 5 ♂♂, 1 ♀, sweeping undergrowth of deciduous forest, 30.v.2015, 1 ♂; Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, on rotting tree trunks, 12.vi.2012, 1 ♀, sweeping vegetation on sandy bars of river, 13.vii.2015, 1 ♂, all JR lgt. (SMOC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping undergrowth of deciduous forest, 14.vi.2011, 3 ♂♂, JR lgt. (SMOC).

Clusiodes caledonicus (Collin, 1912)

RL: EN

Lit.: Bílý Potok, Černousy-V Poli (Máca 2009a).

This species is only known from temperate and northern Europe. It seems to prefer montane forests (Fig. 4) in Central Europe. It is rarely encountered in the Czech Republic (cf. also Máca 2009a).

Bukovec NR [5]: Pralouka, 50°48'40"N 15°21'21"E, 900 m, damp meadow, PT, 2.–21.vii.2010, 2 ♂♂, PV lgt. (MBP); Pralouka, 50°48'38"N, 15°21'22"E, 895 m, on rotting fallen spruce trunks, 16.vii.2015, 2 ♀♀, JR lgt. (SMOC); mixed forest, MT, 31.v.–23.vii.2017, 1 ♂, M. Tkoč & JP lgt. (SMLC). **Nová louka NR [24]**: peat-bog, MT, 11.vii.–1.viii.2014, 2 ♂♂, PV lgt. (SMLC).

Clusiodes geomyzinus (Fallén, 1823) (Fig. 3)

Lit.: Bílý Potok (Máca 2009a).

A Transpalaeartic species restricted to northern and temperate belts. It is uncommon in the Czech Republic, mainly occurring in montane forests on trunks of coniferous trees (Roháček 1995) (Fig. 4).

Bukovec NR [5]: Pralouka, 50°48'40"N 15°21'21"E, 900 m, damp meadow, PT, 2.–21.vii.2010, 2 ♂♂, 1 ♀, MT, 20.v.–15.vi.2010, 3 ♂♂, 1 ♀, 15.vi.–2.vii.2010, 3 ♂♂, PV lgt. (MBP); Pralouka, 50°48'38"N, 15°21'22"E, 895 m, on rotting fallen spruce trunks, 16.vii.2015, 1 ♂, JR lgt. (SMOC). **Holubník Mt. [9]**: 50°50'01"N 15°10'46"E, PYT, 11.v.–16.vi.2011, 1 ♀, PV lgt. (MBP). **Meandry Smědé NR [20]**: Černousy-V Poli, alder grove, MT, 27.iv.–16.v.2012, 1 ♂, JP & PV lgt. (SMLC). **Rudolfovo [33]**: sweeping, 30.v.2012, 1 ♂, JP lgt. (SMLC).

Clusiodes pictipes (Zetterstedt, 1855)

Lit.: Meandry Smědě PR (=NR) (Máca 2009a).

This North and Central European species seems to prefer old deciduous (mainly beech or beech-fir) forests. In the study area it was only recorded by Máca (2009a).

Clusiodes ruficollis (Meigen, 1830)

Lit.: Harta, Smrk (Máca 2009a).

A widespread and common European species, living in various types of forests. It is frequent also in the Czech Republic.

Jizerskohorské bučiny NNR [14]: Poledník Mt., 50°51'18"N, 15°08'48"E, 835 m, on rotting beech trunks, 15.vi.2011, 7 ♂♂, JR lgt. (SMOC); Štolpichy valley, 1.5 km SE of Ferdinandov, 50°51'28"N, 15°11'11"E, 630 m, sweeping undergrowth of beech forest, 15.vi.2012, 2 ♂♂, JR lgt. (SMOC). **Meandry Smědě NR [20]:** Černousy, 0.9 km SW, nr. Dubák pond, 50°59'49"N, 15°02'39"E, 240 m, on rotting tree trunks, 16.vi.2011, 1 ♂, 2 ♀♀, JR lgt. (SMOC); Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, on rotting tree trunks, 12.vi.2012, 1 ♂, JR lgt. (SMOC); Černousy-V Poli, PT, 4.iv.–14.v.2007, 1 ♀, JP & PV lgt. (SMLC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping undergrowth of deciduous forest, 14.vi.2011, 1 ♀, JR lgt. (SMOC). **Poustecká obora [29]:** MT, 27.iv.–16.v.2012, 2 ♂♂, JP & PV lgt. (SMLC).

Heteromeria nigrimana (Loew, 1864)

RL: VU

A rare Palaearctic species, known in Europe only from Great Britain, Sweden, Denmark, Poland, Czech Republic, Switzerland, Hungary and Central European Russia. The records from the Czech Republic are also scarce, most localities are known from N. Moravia (Roháček 1995) and only two from Bohemia (Roháček & Barták 2001) but there are some additional unpublished records from the latter region (Roháček, Barták, unpublished). First record from the area under study.

Meandry Smědě NR [20]: Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, on rotting tree trunks, 12.vi.2012, 1 ♂, JR lgt. (SMOC).

Opomyzidae

The family includes 33 species in Europe and adjacent areas as delimited in Fauna Europaea (van Zuijlen & Roháček 2006; van Zuijlen 2017); 21 of them occurring in the Czech Republic and 19 in Bohemia (Roháček 2009e). Opomyzidae are typically associated with various grassland habitats (including cereal fields) but several species can also live in the grassy undergrowth of forests. The larvae are phytophagous, developing in stems of graminoid herbs and causing dead heart damage to grasses; several species are cereal pests. Six species of Opomyzidae have been reported from the study area by Martinek (1974, 1987); of them only *Opomyza punctata* Haliday, 1833 has not been re-captured during our recent research. A total of 9 species are now known in the territory.

Geomyza balachowskyi Mesnil, 1934

Lit.: Bílý Kostel nad Nisou, Loučná nr. Hrádek nad Nisou (Martinek 1987).

A Holarctic species, widespread throughout Europe; an occasional cereal pest, introduced in the Nearctic Region (Vockeroth 1961).

Horní Řasnice [11]: sand pit, 50°58'25"N, 15°12'46"E, 400 m, sweeping vegetation, 12.vi.2012, 3 ♀♀, JR lgt. (SMOC). **Jizerka [13]:** sweeping vegetation on banks of Jizerka stream, 8.viii.2003, 1 ♀, JP lgt. (SMLC); 50°49'24"N,

15°20'18"E, 860m, sweeping over peat-bog meadow, 20.vii.2013, 1 ♀, JR lgt. (SMOC); sweeping *Molinia caerulea* in montain meadow, 11.ix.2016, 4 ♂♂, 3 ♀♀, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: 50°55'18"N, 15°11'02"E, boggy meadow, 13.ix.2016, 1 ♂, JR lgt. (SMOC), 1 ♂, 1 ♀, JP lgt. (SMLC), under tufts of grasses, 13.ix.2016, 1 ♂, 1 ♀, JR lgt. (SMOC). **Meandry Směd NR [20]**: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230m, 16.vi.2011, sweeping *Scirpus silvaticus* in alder forest, 2 ♂♂, 1 ♀, JR lgt. (SMOC); Černousy, 1 km SW, 225m, 50°00'05"N, 15°02'21"E., sweeping on sandy bars of river, 13.vii.2015, 1 ♂, 1 ♀, JR lgt. (SMOC); Černousy-V Poli, 50°59'43"N, 15°02'52"E, 240m, sweeping over meadow nr pond, 13.vii.2015, 1 ♂, M. Vála lgt. (SMOC). **Šolcův rybník pond [36]**: 3.ix.2004, sweeping, 1 ♀, JP lgt. (SMLC); MT, 6.x.–3.xi.2011, 1 ♂, PV lgt. (SMLC).

Geomyza hackmani Nartshuk, 1984

A species known from North and Central Europe and from Bulgaria; in more southern latitudes associated with mountains.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 3 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Jizerka [13]**: 50°49'24"N, 15°20'18"E, 860m, 13.vi.2011, aspirated from tufts of grasses in meadow, 13.vi.2011, 1 ♂, sweeping over peat-bog meadow, 13.vi.2011, 1 ♀, 16.vii.2015, 1 ♀, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: 50°55'18"N, 15°11'02"E., 390m, sweeping over boggy meadow, 13.ix.2016, 2 ♂♂, 3 ♀♀, under tufts of grasses, 1.vi.2017, 2 ♀♀, JR lgt. (SMOC). **Meandry Směd NR [20]**: Černousy, 1 km SW, 225m, 50°00'05"N, 15°02'21"E, sweeping on sandy bars of river, 13.vii.2015, 1 ♂, JR lgt. (SMOC). **Višňová, 50°59'06"N, 15°01'38"E, 225m, sweeping *Elytrigia repens* in meadow, 14.vi.2011, 1 ♂, JR lgt. (SMOC). **Oldřichov v Hájích [25]**: sweeping meadows, 7.vii.2004, 1 ♀, JP lgt. (SMLC).**

Geomyza martineki Drake, 1992

Lit.: Horní Černá Studnice (Martinek 1974, as *G. combinata*).

A rather common species in eastern part of Central Europe; more scarce in the western part. In the past, this species has been recorded (in Central Europe) under the name *Geomyza combinata* auctt.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 10 ♂♂, 9 ♀♀, JR lgt. (SMOC); nr. Černý potok stream, 430m, sweeping margins of forest, 50°52'10"N, 15°12'14"E, 22.vii.2013, 1 ♂, JR lgt. (SMOC); 0.9 km N, 50°52'53"N, 15°13'17"E, sweeping *Cytisus scoparius* in forest margin, 13.ix.2016, 1 ♀, JR lgt. (SMOC). **Fojtecký mokřad NM [6]**: sweeping, 19.vi.2003, 1 ♀, JP lgt. (SMLC). **Ludvíkov pod Smrkem [18]**: 50°55'18"N, 15°11'02"E, boggy meadow, 13.ix.2016, 1 ♂, JR lgt. (SMOC). **Meandry Směd NR [20]**: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230m, sweeping *Scirpus silvaticus* in alder forest, 16.vi.2011, 1 ♂, sweeping undergrowth of deciduous forest, 16.vi.2011, 1 ♂, JR lgt. (SMOC); Černousy, 0.9 km SW nr. Dubák pond, 240m, 50°59'49"N, 15°02'39"E, sweeping over boggy meadow, 25.vii.2013, 1 ♀, JR lgt. (SMOC); Višňová, 50°59'06"N, 15°01'38"E, 225m, sweeping *Elytrigia repens* in meadow, 14.vi.2011, 1 ♂, 1 ♀, sweeping *Calamagrostis canescens* in boggy meadow, 14.vi.2011, 1 ♂, JR lgt. (SMOC).

Geomyza tripunctata Fallén, 1823

A very common and widespread Holarctic species; probably introduced in the Nearctic Region (Wheeler et al. 1999). Its larvae develop in various grasses and can cause damage also to cereals.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 3 ♂♂, 1 ♀, JR lgt. (SMOC); nr. Černý potok stream, 50°52'10"N, 15°12'14"E, 430m, sweeping forest margin, 22.vii.2013, 1 ♀, JR lgt. (SMOC). **Bukovec NR [5]**: quarry, 50°48'44"N, 15°21'39"E, 927m, sweeping mixed forest and clearing, 16.vii.2015, 1 ♂, 1 ♀, JR lgt. (SMOC). **Jedlový důl NR [12]**: 50°47'24"N, 15°14'29"E, 700m, sweeping undergrowth of mixed forest, 15.vii.2015, 1 ♂, JR lgt. (SMOC). **Jizerka [13]**: 50°49'24"N, 15°20'18"E, 860m, aspirated from tufts of grasses in meadow, 13.vi.2011, 2 ♂♂, at light, 16.vi.2011, 1 ♂, sweeping over peat-bog meadow, 16.vii.2015, 1 ♂, sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 1 ♀, JR lgt. (SMOC). **Kořenov [15]**: 50°46'19"N, 15°22'55"E, sweeping riverside vegetation, 24.vii.2013, 1 ♂, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: 50°55'18"N, 15°11'02"E, sweeping over boggy meadow, 13.ix.2016, 1 ♀, JR lgt.

(SMOC), 3 ♀♀, JP lgt. (SMLC). **Meandry Smědé NR [20]**: Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping vegetation on sandy bars of river, 13.vii.2015, 1 ♂, sweeping rivershore vegetation, 15.ix.2016, 1 ♂, JR lgt. (SMOC). **Rašelinště Jizery NNR [31]**: Na písčinách, 50°52'25"N, 15°17'15"E, 870 m, sweeping over boggy meadows, 12.vii.2015, 2 ♀♀, JR lgt. (SMOC). **Tanvald [37]**: 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 16.vii.2015, 1 ♂, M. Vála lgt. (SMOC). **Tichá říčka NM [38]**: 50°47'10"N, 15°11'22"E, sweeping over peat-bog meadow, 24.vii.2013, 1 ♂, 1 ♀, JR lgt. (SMOC). **Vesec [41]**: sweeping, 7.viii.2004, 1 ♂, JP lgt. (SMOC). **Vratislavice nad Nisou [42]**: YPT, 15.iv.2004, 1 ♀, 24.vi.2004, 1 ♂, JP lgt. (SMOC).

Opomyza florum (Fabricius, 1794)

Lit.: Černá Studnice Mt., Ještěd Mt. (Martinek 1974).

A very common and widespread Palaearctic species developing in various graminoid plants. It is a cereal pest.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping margin of deciduous forest, 13.ix.2016, 1 ♂, JR lgt. (SMOC). **Bohuňovsko [4]**: 50°39'33"N, 15°19'33"E, 330 m, sweeping riverside vegetation, 23.vii.2013, 2 ♂♂, JR lgt. (SMOC). **Bukovec NR [5]**: Pralouka, PYT, 20.viii.–2.ix.2003, 1 ♀, JP & PV lgt.; quarry, 50°48'44"N, 15°21'39"E, 927 m, sweeping mixed forest and clearing, 16.vii.2015, 1 ♂, JR lgt. (SMOC); N slope, 50°48'57"N, 15°21'25"E, 910 m, sweeping vegetation near spring, 14.ix.2016, 2 ♂♂, JR lgt. (SMOC); mixed forest, MT, 31.v.–23.vii.2017, 2 ♀♀, M. Tkoč & JP lgt. (SMOC). **Fojtecký mokřad NM [6]**: sweeping vegetation, 19.vi.2003, 1 ♂, 1 ♀, JP lgt. (SMOC). **Jedlový důl NR [12]**: 50°47'24"N, 15°14'29"E, 700 m, sweeping undergrowth of mixed forest, 15.vii.2015, 1 ♂, JR lgt. (SMOC). **Jizerka [13]**: sweeping banks of Jizerka stream, 8.viii.2003, 1 ♂, 3 ♀♀, JP lgt. (SMOC); 50°49'24"N, 15°20'18"E, 860 m, aspirated from tufts of grasses in meadow, 13.vi.2011, 1 ♂, sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 2 ♂♂, 1 ♀, JR lgt. (SMOC). **Jizerskohorské bučiny NNR [14]**: Poledník Mt., MT, 29.viii.–5.x.2004, 1 ♂, JP & PV lgt. (SMOC); Špičák Mt., sweeping vegetation, 20.vii.2003, 1 ♂, JP lgt. (SMOC); Viničná cesta (path), sweeping vegetation, 15.vii.2003, 2 ♂♂, JP lgt. (SMOC). **Kořenov [15]**: 50°46'19"N, 15°22'55"E, sweeping vegetation along forest path, 24.vii.2013, 1 ♀, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]**: 50°55'18"N, 15°11'02"E, 390 m, sweeping over boggy meadow, 13.ix.2016, 2 ♂♂, JR lgt. (SMOC), 3 ♂♂, 1 ♀, JP lgt. (SMOC). **Malá Strana NR [19]**: sweeping vegetation, 26.vi.2003, 2 ♂♂, 4.vii.2004, 2 ♂♂, JP lgt. (SMOC); 50°45'58"N, 15°12'04"E, 715 m, sweeping over peat-bog meadow, 15.vii.2015, 1 ♂, JR lgt. (SMOC). **Nová louka NR [24]**: peat-bog, MT, 11.vii.–1.viii.2014, 1 ♂, 22.vii.–2.x.2014, 2 ♂♂, PV lgt. (SMOC). **Oldřichov v Hájích [25]**: sweeping meadows, 7.vii.2004, 1 ♂, JP lgt. (SMOC). **Rašelinště Jizery NNR [31]**: Na písčinách, 50°52'25"N, 15°17'15"E, 870 m, sweeping over boggy meadows, 12.vii.2015, 1 ♀, JR lgt. (SMOC). **Smědava [34]**: 2.8 km NE, Krásný potok stream, 50°51'14"N, 15°18'37"E, 888 m, sweeping over montane meadow, 25.vii.2013, 1 ♂, 2 ♀♀, JR lgt. (SMOC). **Tichá říčka NM [38]**: 50°47'10"N, 15°11'22"E, sweeping over peat-bog meadow, 24.vii.2013, 1 ♀, JR lgt. (SMOC). **Vesec [41]**: sweeping, 7.viii.2004, 1 ♂, JP lgt. (SMOC).

Opomyza germinationis (Linnaeus, 1758)

Lit.: Černá Studnice Mt., Ještěd Mt. (Martinek 1974); Loučná nr. Hrádek na Nisou (Martinek 1987).

A Holarctic species; widespread in Europe and introduced in Canada (Wheeler et al. 1999). Common in meadows but it may sometimes also attack cereals.

Bílý Potok [3]: ponds NE of railway station, spring area, swamp, MT, 16.vi.–5.vii.2005, 1 ♂, YPT, 3.–16.vi.2005, 1 ♀, JP & PV lgt. (SMOC); 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 1 ♀, sweeping undergrowth of deciduous forest, 1.vi.2017, 1 ♀, JR lgt. (SMOC). **Bukovec NR [5]**: Pralouka, 50°48'38"N, 15°21'22"E, 895 m, sweeping over montane meadow, 14.ix.2016, 1 ♂, JR lgt. (SMOC). **Fojtecký mokřad NM [6]**: sweeping, 19.vi.2003, 1 ♂, JP lgt. (SMOC). **Frýdlant [7]**: sweeping vegetation on bars of Smědá river, 3.viii.2004, 1 ♂, JP lgt. (SMOC). **Jizerskohorské bučiny NNR [14]**: Poledník Mt., 50°51'18"N, 15°08'48"E, 835 m, sweeping undergrowth of beech forest, 15.vi.2011, 2 ♂♂, 5 ♀♀, JR lgt. (SMOC); Špičák Mt., sweeping, 22.vi.2003, 1 ♂, 2 ♀♀, 20.vii.2003, 3 ♂♂, 3 ♀♀, JP lgt. (SMOC); Štolpichy, 1.5 km SE Ferdinandov, 50°51'28"N, 15°11'11"E, 630 m, sweeping undergrowth of beech forest, 15.vi.2012, 1 ♀, 22.vii.2013, 1 ♀, JR lgt. (SMOC); Velký Štolpich waterfall, 50°51'06"N, 15°11'26"E, 750 m, sweeping undergrowth of mixed forest, 15.vi.2011, 1 ♂, 1 ♀, JR lgt. (SMOC); Viničná cesta (path), sweeping, 15.vii.2003, 1 ♂, JP lgt. (SMOC). **Krásná Studánka [16]**: sweeping vegetation, 19.vi.2003, 1 ♂, JP lgt. (SMOC). **Malá Strana NR [19]**: 50°45'58"N, 15°12'04"E, 715 m, sweeping over

peat-bog meadow, 15.vii.2015, 1 ♂, 1 ♀, JR lgt. (SMOC); 50°45'48"N, 15°12'42"E, 730 m, sweeping undergrowth of mixed forest, 12.ix.2016, 1 ♀, JR lgt. (SMOC). **Meandry Smědě NR [20]**: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230 m, sweeping graminoid vegetation on pond dike, 16.vi.2011, 1 ♀; sweeping undergrowth of deciduous forest, 16.vi.2011, 1 ♀, 15.ix.2016, 1 ♂, 1 ♀, JR lgt. (SMOC); Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping vegetation on sandy bars of river, 13.vii.2015, 1 ♂, JR lgt. (SMOC). **Nová louka NR [24]**: peat-bog, MT, 11.vii.–1.viii.2014, 1 ♂, PV lgt. (SMLC). **Oldřichov v Hájích [25]**: sweeping undergrowth of deciduous forest and meadow, 7.vii.2004, 2 ♂♂, 1 ♀, JP lgt. (SMLC). **Tanvald [37]**: 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 16.vii.2015, 1 ♂, M. Vála lgt. (SMOC). **Vesec [41]**: sweeping, 7.viii.2004, 1 ♂, 16.viii.2004, 1 ♂, JP lgt. (SMLC). **Vratislavice nad Nisou [42]**: sweeping, 4.vii.2005, 1 ♂, JP lgt.

Opomyza lineatopunctata von Roser, 1840 (Figs 5, 6)

An uncommon species with a Palaearctic distribution but not known from the southern belt of the region. Martinek (1987) recorded it from N. Bohemia but not from the area under study. It seems to be associated with the grass *Molinia caerulea* (Fig. 7) at various altitudes (see Martinek 1978, 1987), confirmed also by the new records listed below.

Jizerka [13]: 50°49'24"N, 15°20'18"E, 860 m, sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 9 ♂♂, 8 ♀♀, 14.ix.2016, 1 ♂, 7 ♀♀, at light, 11.ix.2016, 1 ♀, JR lgt. (SMOC, 2 ♂♂ in NMPC). **Rašeliniště Jizery NNR [31]**: YPT, 2.–27.ix.2003, 1 ♂, JP & PV lgt. (SMLC).

Opomyza petrei Mesnil, 1934

Lit.: Loučná nr. Hrádek na Nisou (Martinek 1987).

A Holarctic species occurring in the lowlands of Central Europe, the southernmost part of North Europe, and being widespread in South Europe; it was introduced in the Nearctic Region (Wheeler et al. 1999).

Fojtecký mokřad NM [6]: sweeping, 19.vi.2003, 1 ♀, JP lgt. (SMLC). **Jizerka [13]**: 50°49'24"N, 15°20'18"E, 860 m, sweeping over peat-bog meadow, 16.vii.2015, 1 ♂, JR lgt. (SMOC). **Meandry Smědě NR [20]**: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230 m, sweeping graminoid vegetation on pond dike, 16.vi.2011, 1 ♀, JR lgt. (SMOC).

Opomyza punctata Haliday, 1833

Lit.: Loučná nr. Hrádek na Nisou (Martinek 1987).

An uncommon species only known from North and Central Europe (see van Zuijlen 2017). It is relatively rare in the Czech Republic and its biology is largely unknown (Martinek 1978).

Anthomyzidae

Thirty species of Anthomyzidae are currently known from Europe and adjacent archipelagos (Roháček 2006, 2009a), 20 of which occur in the Czech Republic and 19 in Bohemia (Roháček 2009b, 2016). Adult Anthomyzidae mainly occur in various moist habitats, particularly in those with a prevailing graminoid component. Phytosaprophagous larvae mostly feed between the leaf sheaths of the tillers of grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae) and reed-maces (Typhaceae), only some species are associated with dicotyledonous plants and those of *Fungomyza* develop in decaying macrofungi. There are only a few faunistic records of Anthomyzidae published from the target area in older literature (Martinek 1974, 1987; Roháček 1983) but a number of selected records dealing with host plant asso-

ciations from our recent research are listed in Roháček (2013). The records presented below are based on all available material including most of that published previously. A total of 18 species (i.e. almost all known from Bohemia) were found in the study area, of which only *Arganthomyza socculata* has not been re-collected during our recent field work.

Anagnota bicolor (Meigen, 1838) (Fig. 11)

Lit.: Černousy-V Poli env. (Roháček 2013).

A widespread Eurosiberian species known from northern and temperate Europe and western Siberia, developing in various graminoid and even some dicotyledonous plants (cf. Roháček 2013), largely in marshlands at lower altitudes.

Anagnota major Roháček & Freidberg, 1993

RL: EN

Lit.: Černousy – Dubák pond (Roháček 2013).

A species of similar biology to *A. bicolor* but more thermophilous and much rarer in the Czech Republic. It is known from C. & S. Europe and also from North Africa (Morocco). The previous records from Bohemia are very scarce (cf. Roháček 2006, 2009a, 2013). It can be found in graminoid undergrowth of lowland forests (see Fig. 19).

Anthomyza anderssoni Roháček, 1984 (Fig. 9)

Lit.: Hefmanice – Kodešův vrch Mt. (Roháček 2013).

A Submediterranean species known from S. & C. Europe reaching as far as to Azerbaijan and Russian Osetiya. It is monophagous on reed-mace (*Typha* spp., see Fig. 10) and is uncommon in the Czech Republic (Roháček 2009a, 2013).

Anthomyza collini Andersson, 1976

Lit.: Meandry Smědé – Višňová (Roháček 2013).

Another widespread Palaearctic species which, however, has only recently been recorded from the E. Palaearctic area (Kuril Is. – Roháček & Przhiboro 2016). It is associated with various graminoids and is common in the Czech Republic.

Horní Lučany [10]: sweeping, 23.v.2012, 1 ♂, JP lgt. (SMLC). **Jizerka [13]:** 50°49'24"N, 15°20'18"E, 860 m, aspirated from tufts of grasses in meadow, 13.vi.2011, 1 ♀, JR lgt. (SMOC). **Kořenov [15]:** 50°46'19"N, 15°22'55"E, sweeping riverside vegetation, 31.v.2017, 1 ♂, JR lgt. (SMOC). **Kunratice [17]:** sweeping vegetation on pasture and wetland, 22.vi.2006, 1 ♀, JP lgt. (SMLC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, sweeping over boggy meadow, 1.vi.2017, 5 ♂♂, 3 ♀♀, sweeping undergrowth of deciduous forest, 1.vi.2017, 1 ♀, JR lgt.; sweeping *Typha latifolia* and *Juncus* sp., 30.v.2015, 1 ♀, M. Vála lgt. (SMOC). **Malá Strana NR [19]:** 50°45'48"N, 15°12'42"E, 730 m, sweeping *Carex vesicaria* in peat-bog meadow, 15.vi.2011, 5 ♀♀, 14.vi.2012, 1 ♂, sweeping over peat-bog meadow, 14.vi.2012, 2 ♂♂, 2 ♀♀, 20.vii.2013, 2 ♂♂, 1 ♀, JR lgt. (SMOC); 50°45'58"N, 15°12'04"E, 715 m, sweeping over peat-bog meadow, 15.vii.2015, 2 ♀♀, sweeping *Equisetum fluviatile*, pond shore, 15.vii.2015, 13 ♂♂, 14 ♀♀, JR lgt. (SMOC). **Meandry Smědé NR [20]:** Černousy, NE of Dubák pond, alder grove, MT, 22.vi.–5.vii.2005, 1 ♀, JP & PV lgt. (SMLC); Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping riverside vegetation, 30.v.2017, 1 ♀, JR lgt. (SMOC); Černousy-V Poli env., 50°59'47"N, 15°02'45"E, 250 m, sweeping over boggy meadow, 12.vi.2012, 3 ♂♂, 4 ♀♀, JR lgt. (SMOC); Černousy-V Poli, 50°59'43"N, 15°02'52"E, 240 m, sweeping over wheat (*Triticum*), 30.v.2014, 2 ♂♂, M. Vála lgt. (SMOC); Filipovka, Smědá river bar, MT, 14.vi.–1.vii.2007, 1 ♀, 1.–25.vii.2007, 1 ♀, JP & PV lgt. (SMLC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping over boggy meadow, 30.v.2017, 8 ♂♂, 5 ♀♀, JR lgt. (SMOC); **Pertoltice [27]:** sweeping, 1.vi.2005, 1 ♂, 3 ♀♀, JP lgt. (SMLC).

Anthomyza dissors Collin, 1944 (Fig. 13)

RL: VU

Lit.: Jizerka, Rašeliniště Jizerky (Roháček 2013).

This Transpalaeartic species is monophagous on several large *Carex* species. In C. Europe it mainly lives in montane and submontane wetland habitats, particularly on lagg meadows of raised bogs (Roháček 2013); occurrences on lowland marshes (as found in Meandry Smědě NR in the study area) are to be considered exceptional.

Jizerka [13]: 50°49'24"N, 15°20'18"E, 860m, sweeping over peat-bog meadow, 13.vi.2011, 4 ♂♂, 1 ♀, 20.vii.2013, 3 ♂♂, JR lgt. (SMOC). **Meandry Smědě NR [20]:** Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping *Carex nigra* in boggy meadow, 14.vi.2011, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Rašeliniště Jizerky NNR [30]:** 50°49'44"N, 15°20'13"E, 870m, 22.vii.2013, 13 ♂♂, 3 ♀♀, JR lgt. (SMOC). **Torfowiska Doliny Izery Rezerwat [39]:** Na Izerze, 50°50'58"N, 15°21'28"E, 827m, sweeping riverside graminoid vegetation, 13.vi.2011, 1 ♀, JR lgt. (SMOC).

Anthomyza gracilis Fallén, 1823

Lit.: Rokytnice nad Jizerou, Jizerské hory – Karlov (Roháček 1983); Rašeliniště Jizery (Roháček 2006, 2013); Rašeliniště Jizerky, Horní Maxov – Malá Strana, Bílý Potok, Meandry Smědě – Višňová (Roháček 2013).

A widespread Palaeartic species, common in growths of larger species of Poaceae, Juncaceae, Cyperaceae and Typhaceae in various grassland habitats.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460m, sweeping over xerothermic meadow, 1.vi.2017, 1 ♂, JR lgt. (SMOC). **Bohuňovsko [4]:** 50°39'33"N, 15°19'33"E, 330m, sweeping riverside vegetation, 27.v.2014, 2 ♂♂, sweeping undergrowth of deciduous forest, 31.v.2017, 2 ♂♂, 1 ♀, JR lgt. (SMOC). **Bukovec NR [5]:** Bukovec Mt., 28.viii.2005, sweeping, 1 ♂, 1 ♀, JP lgt. (SMLC); Pralouka, sweeping, 22.vi.2005, 1 ♂, 1 ♀, JP lgt. (SMLC); Pralouka, 50°48'38"N, 15°21'22"E, 895m, sweeping over boggy meadow, 26.v.2014, 1 ♂, sweeping over humid meadow, 16.vii.2015, 6 ♂♂, 1 ♀, JR lgt. (SMOC); Bukovec Mt. top, 50°48'48"N, 15°21'35"E, 970m, sweeping *Calamagrostis villosa*, 16.vii.2015, 1 ♂, 2 ♀♀, JR lgt. (SMOC); Bukovec Mt., quarry, 50°48'44"N, 15°21'39"E, 927m, sweeping mixed forest and clearing, 16.vii.2015, 3 ♂♂, 1 ♀, JR lgt. (SMOC). **Frydlant [7]:** sweeping vegetation on river banks, 22.v.2006, 1 ♂, JP lgt. (SMLC); Frydlant-Harta, 260m, sweeping vegetation on river banks, 12.v.2005, 1 ♀, JP lgt. (SMLC). **Holubník Mt. [9]:** 50°50'01"N 15°10'46"E, 900m, PYT, 14.vii.–24.viii.2011, 1 ♂, PV lgt. (MBP). **Horní Lučany [10]:** sweeping vegetation, 2.viii.2005, 1 ♂, 2 ♀♀, JP lgt. (SMLC). **Horní Řasnice [11]:** 50°58'25"N, 15°12'46"E, sweeping vegetation, 12.vi.2012, 1 ♂, 2 ♀♀, JR lgt. (SMOC). **Jizerka [13]:** sweeping meadows, 29.viii.2004, 1 ♀, JP lgt. (SMLC); 50°49'24"N, 15°20'18"E, 860m, aspirated from tufts of grasses in meadow, 13.vi.2011, 1 ♀, sweeping *Molinia caerulea* in montane meadow, 16.vi.2011, 4 ♂♂, 3 ♀♀, 11.ix.2016, 3 ♂♂, 1 ♀, 14.ix.2016, 2 ♂♂; sweeping over peat-bog meadow, 13.vi.2011, 5 ♀♀, 15.vi.2012, 1 ♂, 1 ♀, 20.vii.2013, 5 ♂♂, 3 ♀♀, 16.vii.2015, 6 ♂♂, 1 ♀; sweeping *Calamagrostis villosa* in montane meadow, 20.vii.2013, 3 ♂♂, 2 ♀♀, JR lgt.; sweeping over montane meadow, 14.ix.2016, 3 ♂♂, 1 ♀, M. Vála lgt. (SMOC). **Jizerskohorské bučiny NNR [14]:** Poledník Mt., YPT (baited by manure), 14.–29.viii.2005, 1 ♂, JP & PV lgt. (SMLC); Poledník Mt., 50°51'18"N, 15°08'48"E, 835m, sweeping undergrowth of beech forest, 15.vi.2011, 3 ♂♂, 3 ♀♀, JR lgt. (SMOC); Štolpichy valley, 1.5 km SE Ferdinandov, 50°51'28"N, 15°11'11"E, 630m, sweeping undergrowth of beech forest, 15.vi.2012, 2 ♂♂, JR lgt. (SMOC); Velký Štolpich waterfall, 50°51'06"N, 15°11'26"E, 750m, sweeping undergrowth of mixed forest, 15.vi.2011, 2 ♀♀, JR lgt. (SMOC). **Kořenov [15]:** 50°46'19"N, 15°22'55"E, sweeping riverside vegetation, 13.vi.2012, 1 ♂, sweeping over boggy meadow, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, sweeping over boggy meadow, 13.ix.2016, 2 ♂♂, 1.vi.2017, 1 ♂, 4 ♀♀, sweeping undergrowth of deciduous forest, 1.vi.2017, 3 ♂♂, 1 ♀♀, JR lgt.; sweeping *Typha latifolia* and *Juncus* sp., 30.v.2015, 2 ♂♂, 1 ♀♀, M. Vála lgt. (SMOC). **Malá Strana NR [19]:** 50°45'48"N, 15°12'42"E, 730m, sweeping over peat-bog meadow, 14.vi.2012, 4 ♂♂, 1 ♀, 20.vii.2013, 3 ♂♂, 2 ♀♀, JR lgt. (SMOC); 50°45'58"N, 15°12'04"E, 715m, sweeping over peat-bog meadow, 15.vii.2015, 2 ♂♂, 4 ♀♀, sweeping *Equisetum fluviatile*, pond shore, 15.vii.2015, 9 ♂♂, 6 ♀♀, JR lgt. (SMOC); sweeping vegetation, 15.vi.2017, 1 ♂, JP lgt. (SMOC). **Meandry Smědě NR [20]:** Černousy, NE of Dubák pond, alder grove, MT, 4.–19.v.2005, 1 ♀, JP & PV lgt. (SMLC); Černousy, Dubák pond, sweeping vegetation, 9.vi.2006, 1 ♂, JP lgt. (SMLC); Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230m, sweeping *Scirpus sylvaticus* in alder forest, 16.vi.2011, 1 ♂, 1 ♀, JR lgt. (SMOC); Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225m, sweeping riverside vegetation, 30.v.2014, 1 ♀, JR lgt. (SMOC); Černousy-V Poli env., 50°59'47"N, 15°02'45"E, 250m, sweeping over boggy meadow, 12.vi.2012, 3 ♂♂, 1 ♀♀, sweeping *Scirpus sylvaticus* in boggy

meadow, 12.vi.2012, 3 ♂♂, 1 ♀, JR lgt. (SMOC); Černousy-V Poli, 50°59'43"N, 15°02'52"E, 240 m, sweeping over wheat (*Triticum*), 30.v.2014, 1 ♂, 2 ♀♀, sweeping over boggy meadow, 30.v.2014, 6 ♂♂, sweeping over meadow near pond, 13.vii.2015, 1 ♂, 1 ♀, 15.ix.2016, 1 ♂, 2 ♀♀, M. Vála lgt. (SMOC); Filipovka, Smědá river bank, MT, 14.vi.–1.vii.2007, 1 ♂, JP & PV lgt. (SMLC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping *Calamagrostis canescens* in boggy meadow, 14.vi.2011, 2 ♀♀, sweeping *Carex nigra* in boggy meadow, 14.vi.2011, 1 ♂, 3 ♀♀, sweeping over boggy meadow, 30.v.2017, 1 ♂, sweeping riverside vegetation, 1 ♀, JR lgt. (SMOC). **Minkovice [21]**: sweeping vegetation in swamp and on bars of stream, 22.vi.2006, 1 ♀, JP lgt. (SMLC). **Poustecká obora [29]**: sweeping vegetation on bars of pond, 22.vi.2006, 2 ♂♂, 1 ♀, JP lgt. (SMLC). **Rašeliníště Jizerky NNR [30]**: Safirový potok, sweeping vegetation on stream banks, 23.vi.2005, 1 ♂, 2 ♀♀, JP lgt. (SMLC). **Rašeliníště Jizery NNR [31]**: 50°51'00"N, 15°21'13"E, 830 m, sweeping graminoid vegetation in montane meadow, 13.vi.2011, 8 ♂♂, 8 ♀♀, JR lgt. (SMOC); Na písčinách, 50°52'25"N, 15°17'15"E, 870 m, sweeping over boggy meadows, 12.vii.2015, 15 ♂♂, 5 ♀♀, JR lgt. (SMOC). **Smědava [34]**: 2.8 km NE, Krásný potok, 50°51'14"N, 15°18'37"E, 888 m, sweeping over montane meadow, 25.vii.2013, 3 ♂♂, 4 ♀♀, JR lgt. (SMOC). **Tanvald [37]**: 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 15.vii.2015, 1 ♂, 1 ♀, 16.vii.2015, 1 ♂, sweeping Desná river bank vegetation, 14.vii.2015, 4 ♂♂, 1 ♀, M. Vála lgt. **Torfowiska Doliny Izery Rezerwat [39]**: Na Izerze, 50°50'58"N, 15°21'28"E, 827 m, sweeping riverside graminoid vegetation, 13.vi.2011, 3 ♀♀, JR lgt. (SMOC).

Anthomyza macra Czerny, 1928

Lit.: Jizerské hory – Karlov (Roháček 1983, as *A. unguolata*).

A Transpalearctic species of the zone of deciduous forests, associated with dicotyledonous plants of humid alluvial forests (Roháček 2009a).

Bohuňovsko [4]: 50°39'33"N, 15°19'33"E, 330 m, sweeping riverside vegetation, 27.v.2014, 1 ♂, sweeping undergrowth of deciduous forest, 31.v.2017, 1 ♀, JR lgt. (SMOC). **Meandry Smědé NR [20]**: Černousy, Dubák pond, sweeping vegetation, 9.vi.2006, 1 ♀, JP lgt. (SMLC). **Tanvald [37]**: 50°44'40"N, 15°18'34"E, sweeping Desná river bank vegetation, 14.vii.2015, 1 ♂, M. Vála lgt.

Anthomyza neglecta Collin, 1944

RL: VU

Lit.: Černousy – Dubák pond, Černousy-V Poli (Roháček 2013).

A Central and North European species, largely developing in large *Carex* and *Scirpus* spp. It was classified as a vulnerable species in the Czech Republic but was subsequently found to be locally common in lowland marshland habitats (Roháček 2009a), hence this rank of jeopardy should be reduced.

Meandry Smědé NR [20]: Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping vegetation on sandy bars of river, 13.vii.2015, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping *Carex nigra* in boggy meadow, 14.vi.2011, 4 ♂♂, 1 ♀, JR lgt. (SMOC). **Šolcův rybník pond [36]**: 50°52'49"N, 15°6'52"E, alnetum-meadow, MT, 26.v.–13.vi.2011, 2 ♂♂, 1 ♀, 1.vii.–3.viii.2011, 3 ♂♂, 1 ♀, PV lgt. (MBP).

Anthomyza pallida (Zettstedt, 1838) (Fig. 12)

Lit.: Černá Studnice Mt., Ještěd Mt. (Martinek 1974); Horní Černá Studnice (Martinek 1987); Jizerka, Rašeliníště Jizery (Roháček 2013).

A Palearctic boreomontane species, in Central Europe commonly found on larger grasses in montane habitats. In the Jizerské hory Mts. it is mainly associated with *Molinia caerulea* (Fig. 7) and *Calamagrostis villosa*.

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 1 ♂, JR lgt. (SMOC). **Bukovec NR [5]**: Pralouka, 50°48'40"N 15°21'21"E, 900 m, damp meadow, PT, 2.–21.vii.2010, 1 ♀, PV lgt. (MBP); Pralouka, 50°48'38"N, 15°21'22"E, 895 m, sweeping over humid meadow, 16.vii.2015, 1 ♀, JR lgt. (SMOC); Bukovec Mt. top, 50°48'48"N, 15°21'35"E, 970 m, sweeping *Calamagrostis villosa*, 16.vii.2015, 2 ♂♂, 1 ♀, JR lgt. (SMOC); Bukovec Mt., quarry, 50°48'44"N, 15°21'39"E, 927 m, sweeping mixed forest and clearing, 16.vii.2015, 2 ♂♂, 1 ♀, JR lgt. (SMOC). **Holubník Mt. [9]**: 50°50'01"N 15°10'46"E, PYT,

16.vi.–14.vii.2011, 1 ♂, 2 ♀♀, PV lgt. (MBP). **Jizerka [13]**: 50°49'24"N, 15°20'18"E, 860 m, sweeping over peat-bog meadow, 13.vi.2011, 6 ♂♂, 5 ♀♀, 20.vii.2013, 2 ♂♂, 16.vii.2015, 1 ♂; sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 1 ♀, 14.ix.2016, 1 ♀, sweeping *Calamagrostis villosa* in montane meadow, 20.vii.2013, 3 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Jizerskohorské bučiny NNR [14]**: Štolpichy valley, 1.5 km SE Ferdinandov, 50°51'28"N, 15°11'11"E, 630 m, sweeping undergrowth of beech forest, 15.vi.2012, 1 ♂, JR lgt. (SMOC), 1 ♂, JP lgt. (SMLC). **Rašeliniště Jizerky NNR [30]**: Klugeho louka, 860 m, peatbog, MT, 17.viii.–1.ix.2005, 1 ♂, JP & PV lgt. (SMLC); sweeping *Carex vesicaria* in peat-bog meadow, 22.vii.2013, 1 ♂, JR lgt. (SMOC). **Rašeliniště Jizery NNR [31]**: 50°51'00"N, 15°21'13"E, 830 m, sweeping graminoid vegetation in montane meadow, 13.vi.2011, 1 ♂, 5 ♀♀, JR lgt. (SMOC); Na písčínách, 50°52'25"N, 15°17'15"E, 870 m, sweeping over boggy meadows, 12.vii.2015, 10 ♂♂, 3 ♀♀, JR lgt. (SMOC). **Smědava [34]**: 2.8 km NE, Krásný potok, 50°51'14"N, 15°18'37"E, 888 m, sweeping over montane meadow, 25.vii.2013, 7 ♂♂, 9 ♀♀, JR lgt. (SMOC). **Smrk Mt. [35]**: spruce forest, 1100 m, YPT, 13.vii.–3.viii.2006, 1 ♂, 3.–24.viii.2006, 1 ♀, MT, 13.vii.–3.viii.2006, 1 ♂, JP & PV lgt. (SMLC); W slope, 1050 m, YPT, 20.vi.–13.vii.2006, 1 ♀, JP & PV lgt. (SMLC). **Šolcův rybník pond [36]**: 50°52'49"N 15°6'52"E, *Alnetum*-meadow, MT, 13.vi.–1.vii.2011, 1 ♂, PV lgt. (MBP). **Tanvald [37]**: 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 15.vii.2015, 5 ♂♂, 2 ♀♀, M. Vála lgt. (SMOC). **Tichá říčka NM [38]**: 50°47'10"N, 15°11'22"E, sweeping over peat-bog meadow, 24.vii.2013, 2 ♂♂, JR lgt. (SMOC). **Torfowiska Doliny Izery Rezerwat [39]**: Na Izerze, 50°50'58"N, 15°21'28"E, 827 m, sweeping riverside graminoid vegetation, 13.vi.2011, 2 ♂♂, JR lgt. (SMOC).

Anthomyza paraneglecta Elberg, 1968

RL: VU

An uncommon species (much rarer than *A. neglecta*) distributed in North and Central Europe (Roháček 2006, 2009a), in the latter restricted to growths of large *Carex* and *Scirpus* species in submontane wetland habitats.

Meandry Smědé NR [20]: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230 m, sweeping *Scirpus sylvaticus* in alder forest, 16.vi.2011, 1 ♂, JR lgt. (SMOC); Višňová, 50°59'06"N, 15°01'38"E, 225 m, sweeping *Carex nigra* in boggy meadow, 14.vi.2011, 1 ♀, JR lgt. (SMOC).

Anthomyza pleuralis Czerny, 1928

This Transpalaeartic species is associated with dicotyledonous undergrowth plants of moist forests (Roháček 2009a, 2013) but, in contrast to *A. macra*, it can also occur on mountains.

Bílý Potok [3]: ponds NE of railway station, spring area, YPT, 19.v.–3.vi.2005, 1 ♂, MT, 3.–16.vi.2005, 1 ♂, JP & PV lgt. (SMLC). **Bohuňovsko [4]**: 50°39'33"N, 15°19'33"E, 330 m, sweeping riverside vegetation, 27.v.2014, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Bukovec NR [5]**: Bukovec Mt., 50°48'44"N, 15°21'40"E, 930 m, sweeping margin of mixed forest, 11.vi.2012, 1 ♂, 1 ♀, JR lgt. (SMOC). **Kořenov [15]**: 50°46'19"N, 15°22'55"E, sweeping riverside vegetation, 13.vi.2012, 1 ♀, 24.vii.2013, 2 ♀♀, sweeping vegetation on forest margin, 29.v.2014, 1 ♂, 2 ♀♀, sweeping over boggy meadow, 13.vi.2012, 1 ♀, JR lgt. (SMOC). **Malá Strana NR [19]**: 50°45'48"N, 15°12'42"E, 730 m, sweeping undergrowth of deciduous forest, 14.vi.2012, 1 ♂, 1 ♀, JR lgt. (SMOC); 50°45'58"N, 15°12'04"E, 715 m, sweeping over peat-bog meadow, 15.vii.2015, 1 ♂, JR lgt. (SMOC). **Meandry Smědé NR [20]**: Černousy-V Poli env., 50°59'47"N, 15°02'45"E, 250 m, sweeping *Scirpus sylvaticus* in boggy meadow, 12.vi.2012, 1 ♀, JR lgt. (SMOC). **Rejdicce [32]**: YPT, 19.–30.v.2005, 1 ♀, JP & PV lgt. (SMLC). **Smědava [34]**: 0.5 km NW, 50°50'44"N, 15°16'08"E, 830 m, caught on wet vegetation, 30.v.2014, 1 ♀, JR lgt. (SMOC).

Arganthomyza socculata (Zetterstedt, 1847)

RL: VU

Lit.: Jizerské hory – Karlov (Roháček 1983, 2006, as *Anthomyza*).

A boreo-alpine species, widespread in the northern belt of the Palaeartic Region and reaching also to USA: Alaska (Roháček & Barber 2016); it also occurs in mountains of more southern areas including Central Europe. In the Czech Republic it is rare, associated with larger grasses in montane meadows. There is only a single old record from the study area (Karlov, VII. 1966, 1 ♀, J. Macek lgt., J. Roháček det., NMPC – examined).

Fungomyza albimana (Meigen, 1830)

This mycophagous species is widespread in Europe and Turkey (Roháček 2013). Its larvae develop in decaying sporocarps of various fungi and adults can be normally found hovering over them (Roháček 2009a). Our new record of a male on flowering umbellifers (Apiaceae) is rare but not unique – Stackelberg (1958, as *Anthomyza*) recorded adults on *Angelica* flowers.

Mšeno nad Nisou [23]: sweeping flowers of Apiaceae, 1.viii.2012, 1 ♂, JP lgt. (SMLC).

Paranthomyza nitida (Meigen, 1838)

A common West Palaearctic species (Portugal to Altai Mts in Russia), developing in damaged stems of dicotyledonous plants in undergrowth of humid forests (Roháček 2009a, 2013).

Bohuňovsko [4]: 50°39'33"N, 15°19'33"E, 330 m, sweeping riverside vegetation, 23.vii.2013, 4 ♀♀, 27.v.2014, 3 ♂♂, 4 ♀♀, JR lgt. (SMOC). **Bukovec NR [5]:** Bukovec Mt. top, 50°48'48"N, 15°21'35"E, 970 m, sweeping *Calamagrostis villosa*, 16.vii.2015, 1 ♀, JR lgt. (SMOC); Bukovec Mt., quarry, 50°48'44"N, 15°21'39"E, 927 m, sweeping mixed forest and clearing, 16.vii.2015, 1 ♂, 2 ♀♀, JR lgt. (SMOC); Bukovec Mt., mixed forest, MT, 31.v.–23.vii.2017, 2 ♂♂, 2 ♀♀, M. Tkoč & JP lgt. (SMLC); 28.viii.2005, sweeping, 1 ♂, 1 ♀, JP lgt. (SMLC); Pralouka, sweeping, 22.vi.2005, 1 ♀, 21.vi.2006, 1 ♀, JP lgt. (SMLC). **Jedlový důl NR [12]:** 670 m, sweeping vegetation on bars of Jedlová stream, 12.vii.2005, 2 ♂♂, 2 ♀♀, JP lgt. (SMLC); 50°47'24"N, 15°14'29"E, 700 m, sweeping undergrowth of mixed forest, 15.vii.2015, 1 ♀, JR lgt. (SMOC). **Jizerka [13]:** sweeping meadows, 19.–22.vi.2006, 1 ♂, JP lgt. (SMLC). **Kořenov [15]:** 50°46'19"N, 15°22'55"E, sweeping over boggy meadow, 13.vi.2012, 1 ♂, sweeping riverside vegetation, 13.vi.2012, 1 ♀, 24.vii.2013, 4 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Meandry Smědé NR [20]:** Černousy, NE of Dubák pond, alder grove, MT, 5.–29.vii.2005, 1 ♀, JP & PV lgt. (SMLC); Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230 m, sweeping undergrowth of deciduous forest, 16.vi.2011, 1 ♀, JR lgt. (SMOC); Černousy, 0.9 km SW, nr. Dubák pond, 50°59'49"N, 15°02'39"E, 240 m, sweeping undergrowth of deciduous forest, 30.v.2014, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC); Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping vegetation on sandy bars of river, 13.vii.2015, 1 ♂, JR lgt. (SMOC); Černousy-V Poli, 50°59'43"N, 15°02'52"E, 240 m, sweeping over boggy meadow, 30.v.2014, 1 ♂, M. Vála lgt. (SMOC). **Paseky nad Jizerou [26]:** sweeping vegetation on bars of stream, 9.ix.2004, 1 ♀, JP lgt. (SMLC). **Plavý [28]:** sweeping vegetation on bars of stream, 23.vi.2006, 2 ♂♂, JP lgt. (SMLC). **Rejdice [32]:** PYT, 16.vi.–5.vii.2005, 2 ♀♀, 5.–28.vii.2005, 2 ♂♂, JP & PV lgt. (SMLC). **Tanvald [37]:** 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 16.vii.2015, 2 ♂♂, M. Vála lgt. (SMOC).

Stiphrosoma cingulatum (Haliday, 1855)

RL: EN

Lit.: Meandry Smědé – Višňová (Roháček 2013).

A West Palaearctic (ranging from Ireland to W. Siberia) species restricted to northern and temperate belts. It is associated with tufts of grasses (Poaceae) and sedges (Cyperaceae) in lowland and foothill marshes (Roháček 2006, 2009a, 2013) and although it is uncommon and rather local it should be considered at most vulnerable (VU) in the Czech Republic.

Meandry Smědé NR [20]: Černousy, 1 km SW, 51°00'05"N, 15°02'17"E, 225 m, sweeping vegetation on sandy bars of river, 13.vii.2015, 1 ♂, JR lgt. (SMOC).

Stiphrosoma laetum (Meigen, 1830)

The species seems to be restricted to North and Central Europe, in more southern latitudes to montane areas. Larvae develop in various graminoids forming clumps in which adults live terricolously (Roháček 2006, 2009a, 2013).

Jizerka [13]: 50°49'24"N, 15°20'18"E, 860 m, sifting decayed grass under *Molinia* tufts, 11.ix.2016, 3 ♀♀, sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 1 ♂, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, under tufts of grasses, 13.ix.2016, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Smědava [34]:** 2.8 km NE, Krásný potok stream, 50°51'14"N, 15°18'37"E, 888 m, sweeping over montane meadow, 25.vii.2013, 1 ♀, JR lgt. (SMOC).

Stiphrosoma sabulosum (Haliday, 1837) (Fig. 14)

Another terricolous species, usually brachypterous (f. brach.), rarely macropterous (f. macropt.), living in tufts of various graminoids (Roháček 2013). It has Holarctic distribution (see Roháček & Barber 2005).

Jizerka [13]: 50°49'24"N, 15°20'18"E, 860 m, aspirated from tufts of grasses in meadow, 13.vi.2011, 6 ♂♂, 8 ♀♀ (f. brach.), sweeping *Molinia caerulea* in montane meadow, 16.vi.2011, 1 ♂, 1 ♀ (f. brach.), in tufts of *Deschampsia caespitosa*, 16.vii.2015, 3 ♂ (f. brach.), JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, under tufts of grasses, 1.vi.2017, 4 ♂♂, 4 ♀♀ (f. brach.), JR lgt. (SMOC). **Meandry Smědé NR [20]:** Černousy, Dubák pond, MT, 19.–31.v.2005, 1 ♀ (f. macropt.), JP & PV lgt. (SMLC); Dubák pond, 50°59'54"N, 15°02'32"E, 230m, sweeping graminoid vegetation on pond dike, 16.vi.2011, 1 ♀ (f. brach.), JR lgt. (SMOC).

Typhamyza bifasciata (Wood, 1911) (Fig. 8)

Lit.: Heřmanice – Kodešův vrch (Roháček 2013).

This exotic-looking species is monophagous on reed-mace (*Typha* spp.) (Roháček 1992, 2009a); it is widespread in the Palaearctic Region (ranging from Spain to Novosibirsk region). In the Czech Republic it mainly occurs in lowland *Typha* habitats (Fig. 10).

Aulacigastridae

A small family with only genus *Aulacigaster* Macquart, 1835 and 3 species in Europe (Rung & Mathis 2011), all of which were recorded from the Czech Republic. Similarly to Periscelididae the larvae of *Aulacigaster* spp. develop in sap runs of various trees and adults can be collected around them or by means of traps baited by beer. In the study area only *A. leucopeza* has formerly been recorded (Máca 2009a); one more species is added below.

Aulacigaster leucopeza (Meigen, 1830) (Fig. 15)

Lit.: Jindřichovský mokřad PP (=NM); Rašeliniště Jizerky NPR (=NNR) (Máca 2009a).

A widespread Palaearctic species living mainly in woodland habitats. It is the most common species of *Aulacigaster* in the Czech Republic. The here recorded capture of adults in pitfall traps is interesting – they surely had to be attracted by the smell of the conservation liquid (a solution of acetic acid in water) used in the trap.

Bílý Kostel nad Nisou [2]: pitfall traps, 7.–21.vi.2017, 5 ♂♂, 1 ♀, PV lgt. (SMLC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, sweeping riverside vegetation, 13.ix.2016, 1 ♂, JR lgt. (SMOC). **Šolcův rybník pond [36]:** 50°52'54"N, 15°6'53"E, MT, 8.iv.–11.v.2011, 1 ♂, PV lgt. (MBP).

Aulacigaster pappi Kassebeer, 2001

The species is known from Central Europe (France, Germany, Switzerland, Czech Republic, Slovakia) but probably occurs also in surrounding areas. Published records from Bohemia are scarce: Hradec Králové-Malšovice (Roháček 2004, as *A. neoleucopeza*), Bláto nr. Uhlířské Janovice (Barták & Roháček 2012), Vráž nr. Písek (Roháček et al. 2013) but there are several unpublished records from the country.

Šolcův rybník pond [36]: 50°52'54"N, 15°6'53"E, MT, 8.iv.–11.v.2011, 1 ♂, PV lgt. (MBP); 50°52'33"N, 15°6'51"E, MT (meat, beer), 1.vii.–3.viii.2011, 1 ♂, PV lgt. (MBP).

Periscelididae

A small family with only 6 species (plus 1 subspecies) in Europe (Papp & Withers 2011; Roháček & Andrade 2017) three of which were recorded from the Czech Republic (Máca 2009b; Roháček & Andrade 2017). Adults can be rarely captured because of living on sap runs of wounded deciduous trees, usually in the tree canopy. No species of Periscelididae has formerly been recorded from the study area but one has been found recently.

Periscelis (Myodris) annulata (Fallén, 1813) (Fig. 16)

This species is widespread in Europe and Near East and the most common one in the Czech Republic. Both larvae and adults are closely associated with sap runs, particularly in crowns of elms and oaks (Papp 1998) and hence are infrequently collected. As for *Aulacigaster leucopeza* above, this species was also surprisingly caught in pitfall traps (with acetic acid) during our field work.

Bílý Kostel nad Nisou [2]: pitfall traps, 7.–21.vi.2017, 2 ♂♂, 2 ♀♀, PV lgt. (SMLC).

Stenomicridae

Another species-poor family with only two genera and three species in Europe (Merz & Roháček 2005), all of which have been found in the Czech Republic (Roháček 2009d). Their larvae probably develop in the phytotelmata formed by leaf bases of large *Carex* and *Scirpus* species (see Roháček 2009g) or even (*P. soniae*) of umbellifers (Merz & Roháček 2005). Two species have been found in the study area but only one of them had been recorded previously (Roháček 2011).

Podocera soniae (Merz & Roháček, 2005) (Fig. 17)

RL: VU

A little known species, hitherto only recorded from Bulgaria, Czech Republic, Germany, Romania, Slovakia and Switzerland (Merz & Roháček 2005), N. Italy (von Tschirnhaus 2008) and Sweden (Roháček 2011). The previous scarce records from the Czech Republic are listed by Merz & Roháček (2005) and Barták & Roháček (2012).

Šolcův rybník pond [36]: 50°52'49"N, 15°6'52"E, 350 m, *Alnetum*-meadow, MT, 26.v.–13.vi.2011, 1 ♀, 13.vi.–1.vii.2011, 1 ♀, PV lgt. (MBP).

Stenomicra cogani Irwin, 1982 (Fig. 18)

Lit.: Černousy – Dubák pond, Višňová (Roháček 2011).

This minute species is widespread in Europe (S. Spain to SW Romania, distribution mapped by Roháček 2009g). It is associated with growths of *Scirpus* and large *Carex* spp. in lowland swampy habitats (Fig. 19); in the Czech Republic it is uncommon, with most known localities situated in N. Bohemia (cf. Roháček 2011).

Asteiidae

The family is represented by 19 species in Europe and adjacent archipelagos (Gibbs & Papp 2007; Carles-Tolrá 2017); only 9 species are known from the Czech Republic and 8 from

Bohemia (Roháček 2009f; Roháček & Máca 2010). They belong to two genera representing ecologically different groups. The *Asteia* spp. have larvae probably (phyto)saprophagous and adults occur in open or semi-open grassy habitats or on flowers while *Leiomyza* spp. are mycophagous in sporocarps of fungi in forested habitats. Apparently, no species of the family has previously been recorded from the Jizerské hory Mts. and Frýdlant region; 4 species have been found during our faunal survey but at least 3 more (*Leiomyza*) species can be expected to occur there.

Asteia amoena Meigen, 1830

A Palearctic species, the most frequent representative of the family in Central Europe. It preferentially occurs in open (grassy and shrubby) habitats.

Albrechtice v Jizerských horách [1]: PT, 1.xii.2006–19.iv.2007, 1 ♂, 8 ♀♀, JP & PV lgt. (SMLC). **Bílý Potok [3]:** ponds NE of railway station, spring area, MT, 29.vii.–19.viii.2005, 1 ♀, JP & PV lgt. (SMLC). **Bukovec NR [5]:** Bukovec Mt., 50.812 N, 15.357 E, 930m, sweeping, 27.viii.2016, 1 ♂, JP lgt. (MBP). **Frýdlant [7]:** sweeping vegetation on bars of river, 22.v.2006, 1 ♂, JP lgt. (SMLC). **Jizerka [13]:** 50°49'24"N, 15°20'18"E, 860m, sweeping *Molinia caerulea* in montane meadow, 11.ix.2016, 2 ♂♂, 2 ♀♀, JR lgt. (SMOC). **Kořenov [15]:** 50°46'19"N, 15°22'55"E, sweeping riverside vegetation, 13.vi.2012, 1 ♀, 24.vii.2013, 2 ♀♀, 31.v.2017, 1 ♂, JR lgt. (SMOC). **Ludvíkov pod Smrkem [18]:** 50°55'18"N, 15°11'02"E, sweeping over boggy meadow, 13.ix.2016, 1 ♂, JR lgt. (SMOC), 1 ♂, 1 ♀, JP lgt. (SMLC); alder grove, MT, 13.ix.–26.x.2016, 1 ♂, PV lgt. (SMLC). **Malá Strana NR [19]:** 50°45'58"N, 15°12'04"E, 715m, sweeping undergrowth of mixed forest, 12.ix.2016, 1 ♀, JR lgt. (SMOC). **Meandry Smědé NR [20]:** Černousy, NE of Dubák pond, alder grove, MT, 4.–23.ix.2005, 1 ♂, JP & PV lgt. (SMLC); Smědá river, 50°59'55"N, 15°02'21"E, sweeping on river bars, 8.viii.2012, 1 ♂, JP lgt.; Černousy-V Poli, 50°59'43"N, 15°02'52"E, 240m, sweeping over meadow nr. pond, 13.vii.2015, 2 ♂♂, 15.ix.2016, 1 ♀, M. Vála lgt. (SMOC). **Mníšek [22]:** 430m, sweeping meadows, 29.v.2005, 1 ♀, JP lgt. (SMLC). **Smrk Mt. [35]:** Smrk Mt. top, spruce forest, 1100m, sweeping, 23.ix.2005, 2 ♂♂, 1 ♀, JP lgt. (SMLC). **Tanvald [37]:** 50°44'40"N, 15°18'34"E, sweeping forest margin vegetation, 16.vii.2015, 1 ♀, M. Vála lgt. (SMOC). **Zadní kopec Mt. [43]:** spruce forest, PT, 18.x.2006–17.iv.2007, 1 ♂, JP & PV lgt. (SMLC).

Asteia concinna Meigen, 1830 (Fig. 21)

Another widespread Palearctic species, common in the Czech Republic. It seems to be associated with tall grass vegetation (often with *Calamagrostis* spp.) in various humid as well as dry habitats (Roháček in litt.).

Bílý Potok [3]: 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2012, 1 ♂, JR lgt. (SMOC); nr. Černý potok stream, 50°52'10"N, 15°12'14"E, 430 m, sweeping forest margin, 22.vii.2013, 2 ♂♂, 1 ♀, JR lgt. (SMOC). **Bohuňovsko [4]:** 50°39'33"N, 15°19'33"E, 330 m, sweeping riverside vegetation, 23.vii.2013, 1 ♂, JR lgt. (SMOC). **Jizerskohorské bučiny NNR [14]:** Špičák Mt., 450–600 m, sweeping, 20.vii.2005, 1 ♂, JP lgt. (SMLC); Velký Štolpich waterfall, 50°51'06"N, 15°11'26"E, 750 m, sweeping undergrowth of mixed forest, 15.vi.2011, 2 ♀♀, JR lgt. (SMOC). **Smědava [34]:** 2.8 km NE, Krásný potok, 50°51'14"N, 15°18'37"E, 888 m, sweeping over montane meadow, 25.vii.2013, 3 ♀♀, JR lgt. (SMOC); 0.5 km NW, 50°50'44"N, 15°16'08"E, 830 m, sweeping vegetation along stream, 22.vii.2013, 1 ♂, JR lgt. (SMOC). **Uhelná [40]:** 50°51'35"N, 14°53'30"E, sweeping over sandy vegetation, 23.vii.2013, 3 ♀♀, JR lgt. (SMOC).

Asteia elegantula Zetterstedt, 1847 (Fig. 20)

RL: VU

A Transpalearctic species, uncommon and infrequent in the Czech Republic (cf. Roháček 2016). It seems to be thermophilous, occurring in grassy vegetation on insolated places of lowland woodland and groves, including sand-pits (Fig. 22).

Šolcův rybník pond [36]: 50°52'33"N 15°6'51"E, MT (meat, beer), 1.vii.–3.viii.2011, 1 ♀, PV lgt. (MBP). **Uhelná [40]:** 50°51'35"N, 14°53'30"E, sweeping over sandy vegetation, 23.vii.2013, 1 ♀, JR lgt. (SMOC).

Leiomyza dudai Sabrosky, 1956

An Eurasian species, the most frequent species of the genus in the Czech Republic. It has mycophagous larvae developing in fungi both in woodland and open habitats.

Poustecká obora [29]: sweeping vegetation on bars of pond, 22.vi.2006, 1 ♀, JP lgt. (SMLC). **Šolcův rybník pond [36]:** 50°52'33"N 15°6'50"E, 350 m, baited PYT, 26.v.–1.vii.2011, 1 ♂, PV lgt. (MBP).

DISCUSSION AND CONCLUSIONS

The biodiversity of the opomyzoid acalyptrate families (except for Clusiidae and Aulacigastridae, see Máca 2009a) have been insufficiently known in the target area up to 2011. This is particularly true for the Jizerské hory Mts and Frýdlant region where no species of some of these families has been recorded to this date. The recent intensive field survey of Diptera performed by P. Vonička and J. Preisler, and subsequently also by the senior author, resulted in much new information which essentially contributed to the knowledge of flies of these families in this formerly neglected region of the Czech Republic despite the fact that no addition to the fauna of the Czech Republic or Bohemia has been discovered.

The **Clusiidae** (treated by Máca 2009a and supplemented here) are now relatively well known in the area under study – 8 species of 11 recorded from the whole of the Czech Republic were found. This diversity is comparable with those of the best explored areas of the Czech Republic like Podyjí NP (Roháček et al. 2005a) or Bílina and Duchcov environs (Roháček & Barták 2001) where also 8 species were ascertained. Moreover, two additional species, viz. *Clusiodes verticalis* (Collin, 1912) and *Hendelia beckeri* Czerny, 1903 can possibly also occur in the area under study in future, particularly in more thermophilous deciduous forest at lowest altitudes. The presence 3 threatened species, viz. *Clusia tigrina* (VU), *Clusiodes caldonicus* (EN) and *Heteromeringia nigrimana* (VU), is surely noteworthy because it shows that the regional woodland community of Clusiidae has hitherto not been pauperized as has happened in managed forests of most other regions.

In **Opomyzidae** the situation is markedly different. Only 9 species has been confirmed to occur in the Jizerské hory Mts and environs, thus less than half of the spectrum known from Bohemia (19 species) or the Czech Republic (21), cf. Roháček (2009e). Inasmuch as some species of *Geomyza* have been incorrectly identified in the past (cf. van Zuijlen & Roháček 2006) it is difficult to compare the here recorded species diversity with those in other areas. However, it is clear that most of the thermophilous and/or xerophilous species (known from the warmest parts of Bohemia and Moravia) are absent here; consequently, the generally harsh climate seems to be the main cause of the paucity of the regional fauna of Opomyzidae in the area under study. The species spectrum includes here only (1) the largely ubiquitous species, (2) cold-tolerant species distributed in North and Central Europe. Of these *Opomyza lineatopunctata* and *O. punctata* are the most interesting species because they seem to be disappearing recently from the Czech Republic although they had not been considered endangered in the country by Martinek & Barták (2005).

In contrast, the related **Anthomyzidae** display unexpected diversity in the study area, comprising 18 species, i.e. almost all of the species known from Bohemia (19 species) and the Czech Republic (20 species). This species-richness is much higher than in all other well explored areas of the Czech Republic where only 10–12 species of Anthomyzidae were

found (see discussion in Roháček et al. 2005b). The spectrum of species recorded here from the Jizerské hory Mts and environs includes also all 6 species listed by Roháček (2005b) as threatened in the Czech Republic (2 EN – *Anagnota major*, *Stiphrosoma cingulatum*, 4 VU – *Anthomyza dissors*, *A. neglecta*, *A. paraneglecta*, *Arganthomyza socculata*). Why are Anthomyzidae so diverse in this territory? The humid to very humid climate and the rich supply of habitats (various types of grassland and marshland) favoured by most species of Anthomyzidae can be the explanation. It is to remark, that also the two remaining species known from the Czech Republic (both very rare and local but hitherto unclassified as regards jeopardy), viz. *Stiphrosoma humerale* Roháček & Barber, 2005 and *Anthomyza elbergi* Andersson, 1976 can possibly occur in the territory studied because the former has recently been recorded from adjacent areas of North Bohemia (Česká Lípa region – Roháček 2009a; Krkonoše Mts – Roháček et al. 2017) and the latter occurs on glacial sand deposits in the Czech Silesia (Hlučín region – Roháček 2016).

Two of the three Czech species of **Aulacigastridae** have been found in the Jizerské hory Mts and environs, this richness equaling that of most other territories studied for Diptera in the Czech Republic. However, in the Podyjí NP, all these 3 species were ascertained; although originally only 2 (the same as in the study area) were recorded (Roháček et al. 2005c), the third, viz. *Aulacigaster falcata* Papp, 1997, has recently been added (Roháček & Máca 2010). Because the latter (more thermophilous) species has also been captured in Central Bohemia (Barták & Roháček 2012) its occurrence in lowland areas of the Frýdlant region cannot be excluded.

The **Periscelididae** are represented by only one species (of 3 known from the Czech Republic and Bohemia) in the study area. Because of living in tree crowns and developing in sap runs on (mainly oak and elm) trees the periscelid flies can only be collected by means of special methods (beer traps, intercept traps in canopies) which have not been applied during our field survey. Therefore some additional species can be expected to live in the area, particularly in lowland oak forests in the Frýdlant region.

The small family **Stenomicrodidae** has two species (of the 3 known from the Czech Republic) in the target area. Because also the third Czech species, viz. *Podocera delicata* (Collin, 1944) is known from North Bohemia: Česká Lípa region (Roháček 2009g), this species may also be found in the (adjacent) study area. The here recorded *P. soniae* is classified as a vulnerable (VU) species by Roháček (2005d, as *Stenomicrodica*) and seems to be really a rare species in the Czech Republic although *P. delicata* could be yet more local in the country.

The **Asteiidae**, having 9 species in the Czech Republic (8 in Bohemia) seem to be poorly represented in the Jizerské hory Mts and adjacent areas. The four species recorded obviously do not show the entire richness of the group in the area. The mycophagous *Leiomyza* species remain underinvestigated and, hence, 2–3 more species can be found here if collecting is targeted specially to flies attracted to sporocarps of macrofungi. Despite the small diversity the local fauna of Asteiidae contains one species threatened in the Czech Republic, viz. *Asteia elegantula* (VU).

In conclusion, the recorded biodiversity of the families treated here seems rather variable in the territory under study. In most families the species richness is comparable to those of other regions of the Czech Republic where these families were investigated in detail. The lower diversity of Periscelididae and Asteiidae seems to be caused by inadequate collecting methods while in Opomyzidae by the climatic and geomorphological conditions causing

the absence of suitable habitats for thermophilous species. On the other hand, the species richness of Anthomyzidae in the area is extraordinary due to very diverse habitats occupied by species of this family.

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SOUHRN

Biodiverzita sedmi zde zpracovaných čeledí dvoukřídlých z nadčeledi Opomyzoidea nebyla v Jizerských horách a přílehlých regionech Frýdlantska a Liberecka do r. 2011 podrobně studována (s výjimkou čeledí Clusiidae a Aulacigastridae, viz. Máca 2009a). Platí to především pro území Jizerských hor a sousedního Frýdlantska, z něhož u některých čeledí nebyl literárně zaznamenán ani jeden druh. Intenzivní terénní průzkum zaměřený na dvoukřídlý hmyz (Diptera) provedený v posledních 15 letech v této oblasti P. Voničkou a J. Preislerem a následně také J. Roháčkem a dalšími dipterology ale tento neutěšený stav podstatně změnil. Výsledky výzkumu tohoto dipterologicky dosud opomíjeného území významně přispěly také k poznání fauny dvoukřídlých sedmi akalyptrátinních čeledí (Clusiidae, Opomyzidae, Anthomyzidae, Aulacigastridae, Perisclididae, Stenomicrodidae a Asteiidae), které jsou předmětem této studie, a to přesto, že z této skupiny dipter zde nebyl objeven žádný druh nový pro faunu České republiky nebo Čech.

Čeď různatkovití (Clusiidae), která byla pojednána již Mácou (2009a) a je zde doplněna novými údaji, je nyní ve studované oblasti poměrně dobře prozkoumaná. Celkem zde bylo zjištěno osm (tj. 72,7%) z 11 druhů známých z celé České republiky. Tato druhová diverzita je srovnatelná se situací v nejlépe prozkoumaných oblastech České republiky, jako je např. Národní park Podyjí, kde bylo nalezeno také osm druhů. Za zmínku stojí, že na studovaném území byly zaznamenány tři ohrožené druhy, *Clusia tigrina* (VU), *Clusiodes caldonicus* (EN) a *Heteromeringia nigrimana* (VU), což dokazuje, že zdejší lesní společenstva čeledi Clusiidae zatím nejsou ochuzena o tyto bioindikční taxony, jak se tomu stalo v obhospodařovaných lesích jiných oblastí ČR. Navíc není vyloučeno, že na území Frýdlantska (nejspíše v nížinných listnatých lesích) mohou být v budoucnu nalezeny ještě další dva druhy čeledi, *Clusiodes verticalis* (Collin, 1912) a *Hendelia beckeri* Czerny, 1903.

V čeledi pestřicovitých (Opomyzidae) je situace diametrálně odlišná. V Jizerských horách a okolí byl potvrzen výskyt pouze devíti (tj. 45%) z 20 druhů fauny České republiky, přičemž jen z Čech je známo 19 druhů. Protože některé druhy rodu *Geomyza* byly u nás v minulosti nesprávně determinovány (viz van Zuijlen & Roháček 2006), je velmi obtížné srovnávat zde zjištěnou druhovou diverzitu s jinými oblastmi ČR. Je ale jasné, že většina teplomilných a/ nebo xerofilních druhů, které známe z nejteplejších částí Čech a Moravy, ve studované oblasti zřejmě chybí. Příčinou druhové chudoby zdejší fauny čeledi Opomyzidae jsou patrně drsné klimatické podmínky v této oblasti. Proto jsou zde zastoupeny pouze (1) druhy ubikvistické a (2) druhy chladnomilné, rozšířené v severní a střední Evropě. Z nich nejzajímavější jsou *Opomyza lineatopunctata* a *O. punctata*, protože tyto druhy patří k recentně mizejícím taxonům v celé České republice, i když dříve nebyly na našem území považovány za ohrožené (viz Martinek & Barták 2005).

Naproti tomu příbuzná čeď hloubilkovití (Anthomyzidae) vykazuje ve zkoumané oblasti neočekávaně vysokou druhovou diverzitu, protože zde bylo zjištěno 18 (tj. 90%) z 20 druhů

fauny České republiky, a tedy téměř všechny z 19 druhů známých z Čech. Tato druhová bohatost je mnohem větší než ve všech ostatních dobře prostudovaných regionech České republiky, kde bylo nalezeno jen 10–12 druhů čeledi Anthomyzidae (viz diskuzi v práci Roháček et al. 2005b). Druhové spektrum zaznamené v Jizerských horách a přilehlých regionech zahrnuje také všech šest druhů čeledi Anthomyzidae uvedených v Červeném seznamu ohrožených bezobratlých České republiky (Roháček 2005b), z nichž dva jsou klasifikovány jako ohrožené (EN) – *Anagnota major*, *Stiphrosoma cingulatum* a čtyři jako zranitelné (VU) – *Anthomyza dissors*, *A. neglecta*, *A. paraneglecta*, *Arganthomyza socculata*. Takto velkou druhovou rozmanitost hloubilkovitých ve zkoumané oblasti je možno vysvětlit vlhkým až velmi vlhkým klimatem a s ním úzce související bohatou nabídkou různorodých mokřadních a lučních biotopů, které druhy čeledi Anthomyzidae upřednostňují. Také zbývající dva druhy známé z České republiky (oba velmi vzácné a lokální, ale dosud bez klasifikace jejich ohrožení), tedy *Stiphrosoma humerale* Roháček & Barber, 2005 a *Anthomyza elbergi* Andersson, 1976, se mohou ve studovaném území vyskytovat, protože první byl nedávno ohlášen z přilehlých oblastí severních Čech (Českolipsko – Roháček 2009a; Krkonoše – Roháček et al. 2017) a druhý byl zase objeven na ložiskách glaciálních písků (které známe i na Liberecku a Frýdlantsku) ve Slezsku (Hlučínsko – Roháček 2016).

Z čeledi Aulacigastridae byly v Jizerských horách a okolí nalezeny dva (tedy 66,7%) ze tří našich druhů, což odpovídá zastoupení této skupiny ve většině ostatních dipterologicky dobře prozkoumaných oblastí České republiky. V NP Podyjí byly zjištěny všechny tři naše druhy, přestože původně zde byly zaznamenány jen dva (Roháček et al. 2005c); ten třetí, *Aulacigaster falcata* Papp, 1997, byl odtud ohlášen dodatečně (Roháček & Máca 2010). Tento (zřetelně teplomilnější) druh byl nedávno zachycen (spolu s oběma ostatními druhy) i ve středních Čechách (Barták & Roháček 2012), proto není jeho výskyt vyloučen ani v dubových porostech na Frýdlantsku.

Čeď prstnatkovití (Periscelididae) je ve studované oblasti zatím zastoupena pouze jedním druhem (ze tří známých v České republice). Protože prstnatky žijí převážně v korunách stromů (hlavně dubů a jilmů), kde se jejich larvy vyvíjejí v míze vytékající z poraněné kůry, dají se tyto mouchy chytat především pomocí speciálních metod (jako jsou např. pivní pasti nebo nárazové pasti umístěné ve větvoví), které však v našem výzkumu nebyly použity. Proto je téměř jisté, že ve studované oblasti (zvláště v nížinných dubových lesích na Frýdlantsku) můžeme očekávat výskyt nějakého dalšího druhu této čeledi.

Malá čeď Stenomicridae má ve zkoumané oblasti dva (tj. 66,7%) ze tří druhů žijících v České republice. Protože však i třetí český druh, *Podocera delicata* (Collin, 1944), je znám ze severních Čech (Českolipsko – Roháček 2009g), očekáváme, že může být nalezen na námi studovaném území, které s regionem Českolipska sousedí. Zde uvedený druh *P. soniae*, který byl klasifikován jako zranitelný (VU) Roháčkem (2005d, as *Stenomicra*), je skutečně vzácný v České republice (i jinde v Evropě), ale *P. delicata* se zdá být na našem území ještě více lokální a tedy zřejmě také více ohrožený.

Čeď Asteiidae, která má v České republice devět druhů (a osm v Čechách), se zdá být na území Jizerských hor a přilehlých oblastí málo zastoupena. Avšak čtyři zde zjištěné druhy (44,4% z české fauny čeledi) patrně nepokrývají skutečnou druhovou pestrost této skupiny ve studovaném regionu. Mykofágní druhy rodu *Leiomyza* zde totiž zůstávají nedostatečně prozkoumané, takže zde mohou být nalezeny ještě dva až tři další druhy tohoto rodu, pokud

terénní sběry budou speciálně zaměřeny na mouchy lákané na hnijící plodnice hub. I přes malou druhovou diverzitu zahrnuje místní fauna čeledi Asteiidae jeden ohrožený druh, *Asteia elegantula*, klasifikovaný v České republice jako zranitelný (VU).

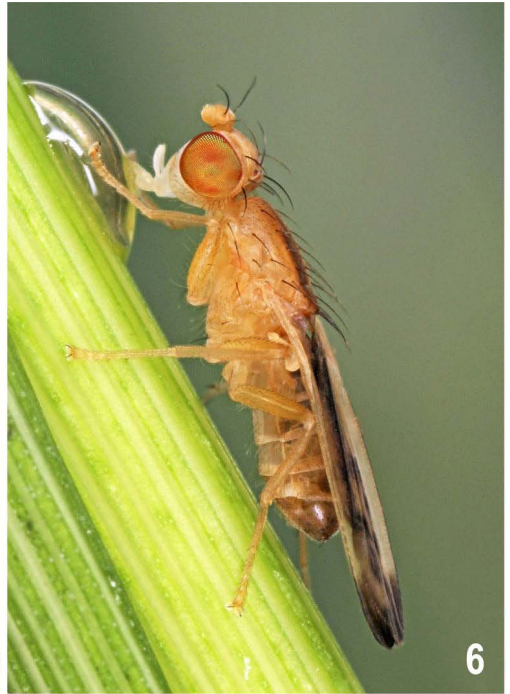
Závěrem je třeba konstatovat, že biodiverzita studovaných čeledí zjištěná na zkoumaném území se zdá být dosti nerovnoměrná. U většiny čeledí byla druhová pestrost srovnatelná s jinými regiony České republiky, kde byly tyto skupiny dvoukřídých podrobně sledovány. Nižší diverzita čeledí Periscolidae a Asteiidae byla zřejmě způsobena neadekvátními metodami sběru, zatímco u čeledi Opomyzidae jí mohly ovlivnit klimatické a geomorfologické podmínky, které podmínily absenci vhodných biotopů pro teplomilné druhy. Na druhé straně druhová bohatost čeledi Anthomyzidae je v oblasti mimořádně vysoká, a to díky velké pestrosti lučních a mokřadních habitatů vhodných pro druhy této čeledi.



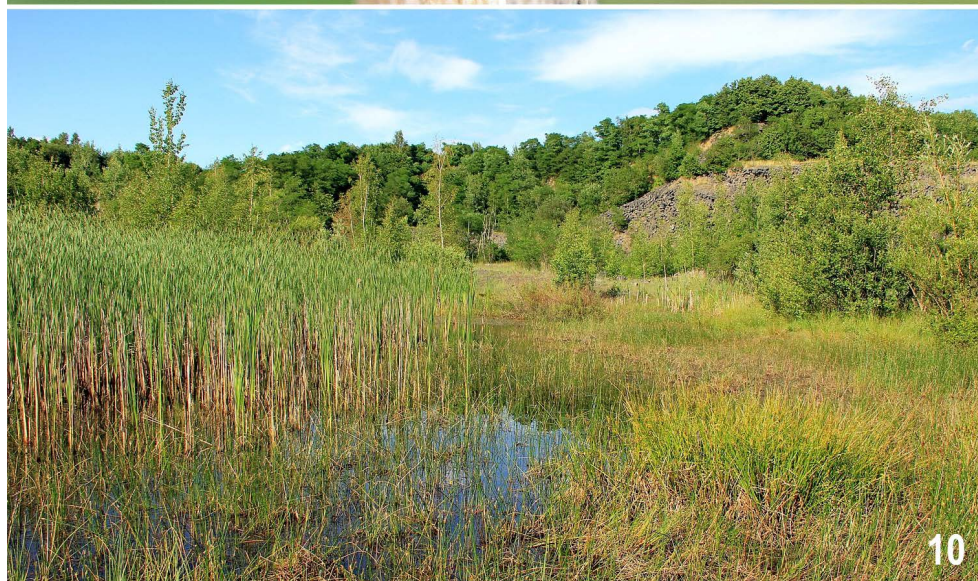
Figs 1–2. Clusiidae and their habitat. 1 – *Clusia tigrina* (Fallén), male laterally; 2 – Štolpichy valley nr. Ferdinandov, beech forest, habitat of *C. tigrina* and some *Clusiodes* species. Photos by J. Roháček.



Figs 3–4. Clusiidae and their habitat. 3 – *Clusiodes geomyzinus* (Fallén), male sublaterally; 4 – Pralouka in Bukovec NR, fallen dead spruce trunks at forest margin, habitat of four species of Clusiidae, including *C. geomyzinus* and *C. caledonicus*. Photos by J. Roháček.



Figs 5–7. Opomyzidae and their habitat. 5 – *Opomyza lineatopunctata* von Roser, male dorsally; 6 – same specimen, laterally; 7 – Jizerka, meadows with *Molinia caerulea* (in foreground) and other graminoids, habitat of 6 species of Opomyzidae including *O. lineatopunctata*. Photos by J. Roháček.



Figs 8–10. Anthomyzidae and their habitat. 8 – *Typhamyza bifasciata* (Wood), mating pair on dead *Typha* stem; 9 – *Anthomyza anderssoni* Roháček, pair on the same plant; 10 – Heřmanice-Kodešův vrch, growth of *Typha angustifolia* in quarry pool, habitat of both these species. Photos by J. Roháček.



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Figs 11–14. Some Anthomyzidae from the study area. 11 – *Anagnota bicolor* (Meigen), mating pair on *Scirpus sylvaticus* leaf; 12 – *Anthomyza pallida* (Zettstedt), male on grass stalk; 13 – *Anthomyza dissors* Collin, male on *Carex vesicaria* leaf; 14 – *Stiphrosoma sabulosum* (Haliday), brachypterous female on grass stalk. Photos by J. Roháček.



Figs 15–16. Aulacigastridae and Periscelididae from the study area. 15 – *Aulacigaster leucopeza* (Meigen), male laterally; 16 – *Periscelis (Myodris) annulata* (Fallén), female laterally. Photos by J. Roháček.



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Figs 17–19. Stenomicridae and their habitat. 17 – *Podocera soniae* (Merz & Roháček), female sublaterally; 18 – *Stenomicroa cogani* Irwin, female dorsally, on *Scirpus sylvaticus* leaf; 19 – alluvial alder swamp at Dubák pond with *Scirpus* growth, habitat of *S. cogani* and also *Anagnota major* (Anthomyzidae). Photos by J. Roháček.



Figs 20–22. Asteiidae and their habitat. 20 – *Asteia elegantula* Zetterstedt, male subdorsally; 21 – *Asteia concinna* Meigen, male dorsally, on *Calamagrostis* stalk; 22 – sand-pit near Uhelná with sparse grassy spots, habitat of both these species. Photos by J. Roháček.