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Diptera of the Pálava Biosphere Reserve of UNESCO, II
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Carnidae, Tethinidae, Milichiidae

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The Carnidae, Tethinidae and Milichiidae are small acalyptrate families, belonging to species-poor groups, particularly in central Europe. Most species belong to uncommon taxa but some may be abundant in suitable habitats. All are considered members of the superfamily Carnoidea (=Chloropoidea) and, hence, they are treated here together although they differ considerably in external appearance and biology. Carnidae were formerly often treated under Milichiidae. However, the most recent phylogenetic studies reveal that these two groups are not very closely related. Faunistic knowledge of Carnidae is rather good in the Czech Republic compared to other European countries although only several areas of the country were thoroughly studied (cf. ROHÁČEK 1996). 20 species in 3 genera are known in the Czech Republic (see ROHÁČEK 1997); of these, 10 species were recorded from the Pálava Biosphere Reserve (extended concept), mostly by GREGOR & PAPP (1981). An eleventh species, new to the fauna of the Czech Republic, is added to the local fauna here. Tethinidae and Milichiidae have been faunistically under-investigated in the Czech Republic (see ROHÁČEK & GREGOR 1984; ROHÁČEK 1992, 1996) and also the recent knowledge is insufficient in spite of the fact that most species known to occur in central Europe have been recorded. The most recent checklist (ROHÁČEK 1997) listed 3 species (in three genera) of Tethinidae and 20 species (7 genera) of Milichiidae from the Czech Republic. In the Pálava B.R. only 1 species of Tethinidae (and a second is highly probable, see below) and 10 species of Milichiidae are known, but the latter number is considered to be only two-thirds of the actual species potential.

The catalogue of Palaearctic Diptera (PAPP 1984) is followed here as regards the nomenclature of Carnidae, that of Tethinidae follows MATHIS & MUNARI (1996) and that of Milichiidae PAPP (1984). The central European species of Carnidae can be identified by PAPP's (1978) key supplemented by some subsequent studies of the same author (PAPP 1981, 1997). However, most species are reliably recognizable only in the male sex by genitalia examination. Genera of Tethinidae can be identified by a new key in MATHIS & MUNARI (1996) and most central European species by the somewhat outdated treatment of SOÓS (1981), suplemented by the paper of HARDY & DELFINADO (1980). However, there is no recent revision of European species of the mainly coastal genus *Tethina*. COLLIN's (1960, 1966) and BESCHOVSKI's (1994) studies are indispensable for their identification. Milichiidae of central Europe can be identified using HENNIG (1937) and PAPP (1978, 1993).

Larvae of all species of Carnidae are saprophagous in the widest sense but most of them develop in decayed organic matter of animal origin, i.e. in excrement or carrion.

Some species are specialized, either copropagous or necrophagous, but other are polysaprophagous, developing in a number of different media, even in decayed fungi or plant matter (some *Meoneura* spp.). Adults usually occur on or near the breeding substrates of larvae. Several species are associated with bird's nests (e.g. *Meoneura neottiophila, M. prima*); *Carnus hemapterus* is particularly specialized in this habitat, not only because its larvae feed on and pupariate in debris in the nest but mainly because adults fly to occupied nests, become attached to nestlings, discard their wings (the females becoming strongly physogastric in addition) and feed semiparasitically on their skin secretions or even blood.

Tethinidae are usually halophilous or halobiont, being associated with saline biotopes, both in coastal marine and inland habitats (salty lakes, alkaline springs, salt marshes etc.). Their biology, pre-imaginal development and immature stages are mostly unknown; larvae are probably saprophages. However, there are a few species, particularly of the genus *Pelomyia*, which are not distinctly halophilous. This may also be the case with the only species of Tethinidae, *Pelomyia steyskali*, recorded from the Pálava B.R. The habitats and biology of Milichiidae are more diversified, although their larvae are also widely saprophagous in various substrates and habitat niches, such as decaying vegetation, wood detritus, bird and ant nests (many species are myrmecophilous), many types of excrement, rotting carrion, dead insects and snails, etc.

All families comprise small to very minute dark flies which are seldom collected by standard netting or sweeping methods. For instance, only traps baited with dung, decayed meat or other rotten animal matter will yield numbers of carnid specimens.

History of investigation. The first record of Carnidae from the Pálava B.R. is that of BALÁT & BAUER (1955) dealing with *Carnus hemapterus* in the nests of *Ardea cinerea* and *Nycticorax nycticorax* in Lednice. The latter host record is also noted by CHALUPSKÝ & POVOLNÝ (1983) who added material from a nest of *Corvus monedula*. Results of extensive baited trapping of synanthropic Diptera, undertaken in the Pavlovské vrchy Hills and close vicinity by F. GREGOR jr. and D. POVOLNÝ, were published (as regards Carnidae) by GREGOR (1973) and GREGOR & PAPP (1981). A few additional data are added here on the basis of specimens recently obtained during biomonitoring studies by ROZKOŠNÝ & VAŇHARA (1995b). Representatives of Tethinidae and Milichiidae have only recently been recorded from the Pálava B.R. ROHÁČEK (1992) noted the occurrence of the single species of Tethinidae in the area under study and ROZKOŠNÝ (1978), VAŇHARA (1986) and ROHÁČEK (1996) reported 4 species of Milichiidae. Five species of Milichiidae are added here but at least four to five more are probable.

Noteworthy records. Two species, viz. *Meoneura acuticerca* Gregor, 1973 and *M. milleri* Gregor, 1973, were described from the Pavlovské vrchy Hills - Děvín Hill (holotype and paratypes) and both are only known from the study area in the Czech Republic (GREGOR & PAPP 1981). These species were overlooked and are thus missing in both lists of species described from the study area (ROZKOŠNÝ & VAŇHARA 1995b, 1996). Moreover, *M. pseudoflavifacies* Papp, 1997 **stat.n.** (described recently as a subspecies of *M. carpathica* from the Alps) is recorded here as a new addition to the carnid fauna of the Czech Republic (Pavlovské vrchy Hills, Kotel). *Pelomyia steyskali* is obviously not a native species in Europe; it was probably introduced from the Nearctic Region (see ROHÁČEK 1992) and subsequently established synanthropic populations in the Czech Republic. It is to be noted

that there is a second species of Tethinidae, viz. the halophilous *Pelomyiella mallochi* (Sturtevant, 1923), in the Czech Republic only know from a single record in a salty meadow near Novosedly, the occurrence of which in salty habitats in the Pálava B.R. (e.g. in the Slanisko Reserve at Sedlec) is possible. The discovery of the two rare species of *Phyllomyza* (*P. longipalpis* and *P. melania*) are the only known records from Moravia.

Monitoring. No species of Carnidae and Tethinidae and only one of Milichiidae, viz. *Phyllomyza securicornis*, were reported during previous studies monitoring Diptera in the study area (VAŇHARA 1981, 1986, ROZKOŠNÝ & VAŇHARA 1995a), chiefly because of inappropriate collecting methods for this group.

Conservation. No species of the families treated is listed in the Intimation No. 395 of the Ministry of Environment of the Czech Republic or in the national Red Book (ČEPELÁK et al. 1992). Despite this fact, both species described from the study area (*Meoneura acuticerca, M. milleri*) as well as the rare myrmecophilous species of *Phyllomyza*, particularly *P. equitans*, *P. longipalpis* and *P. melania*, are considered vulnerable, chiefly because of their restricted distribution in Europe and association with limestone rocky steppes, meadows and forest-steppe ecosystems with a rich abundance of ants' colonies, respectively. *Milichia ludens*, being associated with tree inhabiting ants living in old deciduous forests, is considered vulnerable in the Czech Republic.

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COLLECTIONS EXAMINED

9. Coll. Faculty of Science, Masaryk University, Brno, J. VAŇHARA leg.
10. Coll. Silesian Museum Opava, J. ROHÁČEK and J. SCHLAGHAMERSKÝ leg.
11. Coll. M. BARTÁK, Radomská 496/1, 181 00 Praha 8, Š. KUBÍK leg.

ABBREVIATIONS

General abbreviations: see comments on abbreviations (pp. 13-19) and a separate Appendix. Abundance and frequency values are derived from total number of specimens examined and/or recorded (A) and of locality records (F) from the study area.

Special abbreviations: ha halophilous, mf myrmecophilous, ni nidicolous (living in birds' nests), sy synanthropic.

Example: **Meoneura acuticerca* Gregor, 1973: DV[1] (2, 4[2]), tf-xt[3], co[4], A3[5], F2[6], ?SBM[7], VI-X[8], VU[9].

Explanation: An asterisk (*) preceding the name indicates that the species is known to occur only in the Pálava B.R. (within the Czech Republic), [1]locality, [2]number of source, [3]ecological characteristics, [4]trophic relations, [5]abundance, [6]frequency, [7]distribution, [8]time of occurrence, [9]conservation category.

LIST OF SPECIES

CARNIDAE

Carnus hemapterus Nitzsch, 1818: LE (1, 5), me-ni, pa-sa, A2, F1, HOL, III-VIII.

**Meoneura acuticerca* Gregor, 1973: DV (2, 4), SK (4), tf-xt, co, A3, F2, ?SBM, VI-X, VU.

M. freta Collin, 1937: DV (4), HL (9), me-tf, ne, A4, F3, EUR, V-IX.

M. hungarica Papp, 1977: DV, SK (4), tf, co, A4, F3, W PAL, IV-IX.

**M. milleri* Gregor, 1973: DV (2, 4), tf-xt, co, A3, F1, CEU, VI-X, VU.

M. minutissima (Zetterstedt, 1860): DV (2, 4), LE (10), me, co, A1, F2, EUR, V-X.

M. neottiophila Collin, 1930: DV (4), me-ni, ne-sa, A1, F1, W PAL, IV-IX.

M. prima (Becker, 1903): LE (4), me-sy, co-ne, A2, F1, HOL, VI-IX.

**M. pseudoflavifacies* Papp, 1997: KO (9), ?me, ?co, A1, F1, CEU, VII-VIII.

M. triangularis Collin, 1930: DV (2, 4), me, co-ne, A3, F1, HOL, IV-X.

M. vagans (Fallén, 1823): DV (4), me, ne, A2, F1, HOL, V-IX.

TETHINIDAE

Pelomyia steyskali Hardy et Delfinado, 1980: LE (7), me-sy-?ha, ?sa, A1, F1, HOL (PAL introd.), V-X.

MILICHIIDAE

Desmometopa sordida (Fallén, 1820): SA (9), SE, SL, SN (10), me-tf, sa-ne, A3, F4, HOL, V-X.

Leptometopa latipes (Meigen, 1830): LE (8, 10), HL (9), me-sy, co-sa, A2, F2, COS, V-X.

Madiza glabra Fallén, 1820: HL (6), me-sy, co-sa, A2, F1, HOL, III-X.

Milichia ludens (Wahlberg, 1847): HL, MD (10), me-mf, ?sa, A3, F2, EUR, IV-IX, VU.

Neophyllomyza acyglossa (Villeneuve, 1920): MD (10), me, xy-sa, A1, F1, PAL, V-X.

Phyllomyza donisthorpei Schmitz, 1923: HL, MD, SN (10), me-mf, ?sa, A3, F3, EUR, VI-VIII.

P. equitans (Hendel, 1919): HL, MD (10), me-?mf, ?sa, A1, F2, EUS, IV-IX, VU.

P. longipalpis (Schmitz, 1924): HL (3, 10), MD (10), me-?mf, ?sa, A2, F2, CEU, VI-VII, VU.

Ph. melania (Hendel, 1919): HL, MD (10), me-?mf, sa, A1, F3, CEU, VI-VII, VU.

Ph. securicornis Fallén, 1823: HL (6, 10), MD (10), KL (11), me-mf, sa, A2, F3, HOL, III-X.

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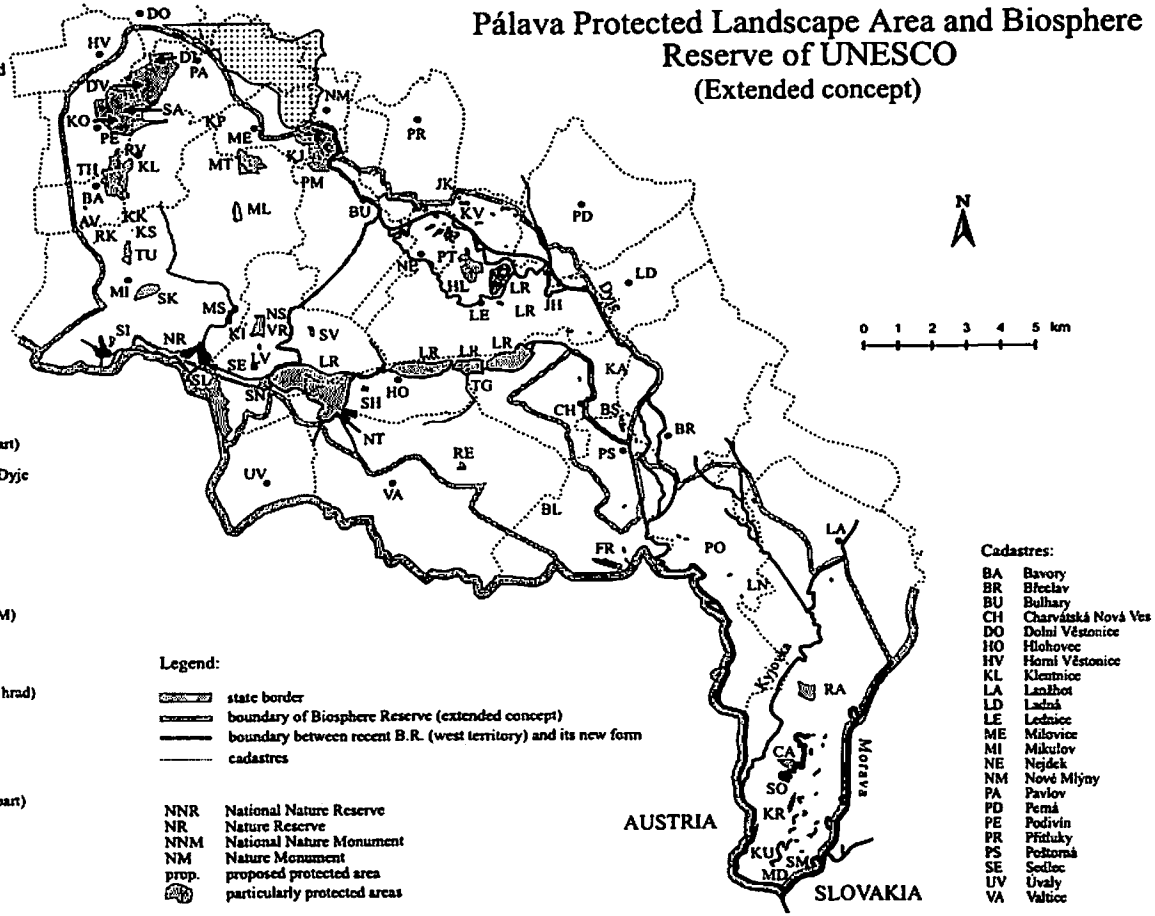
APPENDIX: 1

Particularly protected areas and local names:

AV	Anenský vrch (NM)
BL	Boří les
BS	Bruksa (prop.)
CA	Cahnov (NNR, part)
DI	Děvičky (Dívčí hrady)
DV	Děvín (NNR, part)
FR	Františkův rybník (NR)
HL	Horní les nr. Lednice
JII	Janův hrad
JK	Jezírko Kutnar (NM)
KA	Kanči obora nr. Lednice
KI	Kinberk (NM)
KJ	Křivé jezero (NNR)
KK	Kočičí kámen (NM)
KO	Kotel (NNR, part)
KP	Klentnický potok valley
KR	Krumpava (prop.)
KS	Kočičí skála (NM)
KU	Košárské louky
KV	Květné jezero (NM)
LN	Lány
LR	Lednické rybníky (NNR, part)
LV	Liščí vrch (NR)
MD	confluence of Morava and Dyje
ML	Milovický les (prop.)
MS	Mušlov
MT	Milovická stráň (NR)
NR	Nový rybník (prop.)
NS	Nad střelnicí (prop.)
NT	Nesyt (LR part)
PM	Panenský Mlýn
PO	Pohansko
PT	Pastvisko nr. Lednice (NNM)
PV	Pavlovské vrchy (Pálava)
RA	Ranšpurk (NNR)
RE	Rendezvous (NNM)
RK	Růžový kopec (NM)
RV	Růžový vrch (NR) (Sirotčí hrad)
SA	Soutěska (NNR, part)
SH	Stará hora (prop.)
SI	Sibeničník (NR)
SK	Svatý Kopeček (NR)
SL	Skalky (prop.)
SM	Sekulská Morava (prop.)
SN	Slanisko nr. Nesyt (NNR, part)
SO	Soutok (NNR, part)
SV	Studánkový vrch (prop.)
TG	Tři grácie
TH	Tabulová (NNR) (Stolová)
TU	Turold (NR)
VR	Vysoký roh



APPENDIX: 2

General Abbreviations

Ecosystem and habitat types

1.0 Woodland ecosystems and habitats
1.1 Natural and semi-natural woodlands
1.1.1 Woodlands outside alluvium
1.1.1.1 Cornel oakwoods (*Corni-Querceta pubescentis*)
1.1.1.2 Maple-cornel oakwoods (*Corni-Querceta pubescentis aceris*)
1.1.1.3 Beech-oakwoods (*Fagi-Querceta*)
1.1.1.4 Maple-hornbeam oakwoods (*Carpini-Querceta aceris*)
1.1.1.5 Hornbeam oakwoods (*Carpini-Querceta*)
1.1.1.6 Lime maple woods (*Tili-Acereta*)
1.1.2 Floodplain forests and shore growths
1.1.2.1 Willow alder groves (*Salici-Alneta*)
1.1.2.2 Oak-ash woods (*Querci-Fraxineta*)
1.1.2.3 Poplar-elm ash woods (*Ulmi-Fraxineta populi*)
1.1.2.4 Hardwood-elm ash woods (*Ulmi-Fraxineta carpini*)
1.2 Cultivated woodlands
1.2.1 Mixed forests
1.2.2 Spruce stands
1.2.3 Scots pine stands
1.2.4 Black locust stands
1.2.5 Windbreaks
1.2.6 Parks
1.2.7 Alleys
2.0 Non-woodland ecosystems and habitats
2.1 Natural and supplementary non-woodland habitats
2.1.1 Limestone rocks and scree
2.1.2 Rocky steppe
2.1.3 Grassy steppe
2.1.4 Sandy habitats
2.1.5 Littoral habitats and swamps
2.1.6 Halophilous habitats
2.2 Non-woodland habitats in cultivated landscape
2.2.1 Flooded (floodplain) meadows
2.2.2 Non-flooded meadows
2.2.3 Fields
2.2.4 Field balks and paths
2.2.5 Vineyards
2.2.6 Orchards
2.2.7 Gardens
2.2.8 Ruderal and other degraded habitats

Ecological characteristics

eu euryoecious
hg hygrophilous
me mesophilous
ps psychrophilous
sk skiophilous
tf thermophilous
xt xerothermic

Trophic relations

co coprophagous
mo monophagous
my mycophagous
ne necrophagous
ol oligophagous
pa parasitic, parasitoid
ph phytophagous
po polyphagous within ph
pp polyphagous
pr predatory
sa saprophagous
xy xylophagous

Abundance

A1 very rare
A2 rare
A3 fairly numerous
A4 numerous
A5 very numerous

Frequency

F1 very scarce
F2 scarce
F3 medium frequent
F4 frequent
F5 very frequent

Species conservation

EX extinct
CR critically endangered
EN endangered
VU vulnerable

Distribution

ATL Atlantic
CEU Central European
COS Cosmopolitan
EUA Eurasian
EUR European
EUS Eurosiberian
HOL Holarctic
PAL Palaearctic
PON Pontic
SBB Subboreal
SBM Submediterranean
TUR Turanic

* species occurring only in Pálava B.R. (within the Czech Republic)