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František Gregor, Rudolf Rozkošný,
Miroslav Barták & Jaromír Vaňhara

Manual of Central European Muscidae (Diptera)

Morphology, taxonomy,
identification and distribution



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Manual of Central European Muscidae (Diptera): Morphology, taxonomy, identification, and distribution

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Morphology, taxonomy, identification, and distribution

by

FRANTIŠEK GREGOR, RUDOLF ROZKOŠNÝ, MIROSLAV BARTÁK &
JAROMÍR VAŇHARA

with 54 plates

Abstract

This Manual of Central European Muscidae summarizes all important data on the morphology, taxonomy and distribution of the regional species from the period 1965–2014 (i.e. since publication of the celebrated monograph on the Palaearctic species of this family by Hennig in 1955–1964). The introductory part includes the characteristics of the family and a review of basic systematic studies. Taxonomic and faunistic data from Central Europe (Germany, Poland, the Czech Republic, Slovakia, Switzerland, Austria and Hungary) are reviewed up to the present. Additional chapters deal with current knowledge of the morphology, development, biology and classification. The identification keys enable the families of the Calyptrata and the various categories of Central European Muscidae (subfamilies, genera and species) to be identified. In the review of species, all 406 regional species are discussed, with information on their distinguishing characters, their known geographical distribution, and the adult flight period. The morphological terms used in the keys and the species characteristics are illustrated by 933 figures on 54 plates. Special attention is given to figures of the male and female terminalia as the most important criteria of species-specificity. Distribution data on the Central European species are given in an extensive table which includes their distribution country by country, their biogeographical classification, and their geographical distribution outside Europe.

Key words: Calyptrata, Muscidae, systematics, morphology, identification keys, distribution, Central Europe

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Introduction

The Muscidae are small to middle sized flies between 2.0–12.0 mm, rarely reaching a length of 18.0 mm (e.g. *Mesembrina mystacea*). They are predominantly dark, sometimes with an inconspicuous pattern on the thorax or abdomen, some species being yellow to a varying extent and members of some genera resembling calliphorids with their metallic sheen. The configuration of setae on the head, thorax, abdomen and legs contains the most important diagnostic characters. The Muscidae, like all the higher flies from the Calyprtrata family group, bear a muscoid type of antenna provided with a longitudinal cleft on the pedicel. The antennal arista is always well developed, bare, pubescent or plumose. Three pairs of orbital setae with the first pair proclinate undoubtedly belong to the groundplan characters though they may be reduced especially in males. The proboscis is usually rather short, with large labella, but is rigid, slender and elongate in several blood-sucking forms. The meron is bare or at most finely haired, only *Eginia ocypterata* with a group of setae. Vein M_1 may be slightly or conspicuously upcurved in distal part, so that cell r_{4+5} may be more or less narrowed apically in some groups. The anal vein (A_1) is usually well developed (abbreviated in *Azeta*) but it never reaches the wing margin. The true dorsal setae on the hind tibia are mostly absent; on the other hand, a long posterodorsal seta (the *calca*) may be developed in the distal half. The male genitalia may display useful diagnostic characters, but they are rather uniform in many species groups or even genera. The male cerci usually form a simple cercal plate (mesolobus). The female post-abdominal segments are modified into a short or longer telescopic ovipositor.

The larvae are muscoid, spindle-shaped or elongate cylindrical, rarely provided with pairs of prolegs. The cephalopharyngeal apparatus is adapted to the different modes of life, characterized chiefly by the presence of accessory sclerites in the area of the mandibular hooks. The larvae are chiefly predaceous, only those of the tribes Muscini and Stomoxyini being mostly coprophagous.

The majority of adult Muscidae belong to the typical inhabitants of broad-leafed and coniferous forest zones and thus they are less common in open, exposed or dry habitats. However, many species are adapted to anthropogenically changed ecosystems

and are very characteristic hemisynanthropic or even eusynanthropic forms. Some species are blood-sucking and, like several secretophagous species, may transfer various pathogens.

A basic modern revision of the Central European species was published by HENNIG (1955–1964) within his revision of the Muscidae prepared for the famous E. LINDNER's "Die Fliegen der palaearktischen Region". A key to the British species (D'ASSIS-FONSECA 1968) includes numerous valuable diagnostic characters though many Central European species are not there. Additions to the systematics of regional species were subsequently presented by ACKLAND & PONT (1966), LAVCHIEV (1968, 1970, 1971, 2003), MIHÁLYI (1974a, b, 1975a, b), PONT (1976, 1980, 2000, 2001a, b), MICHELSEN (1977, 1978), LUKASHOVA (1983), ZINOVJEV (1987), GREGOR (1988, 1991), PERIS (1990), CEIANU (1999) and GREGOR & ROZKOŠNÝ (2007b, 2009a), as well as authors who revised some of the classical collections (see Classification).

For the purpose of this review, Central Europe is considered to include Germany, Poland, Czech Republic, Slovakia, Switzerland, Austria and Hungary. The annotated catalogue of the Palaearctic species (PONT 1986a) also stimulated the compilation of national lists for Germany (TESCHNER 1999), Poland (DRABER-MOŃKO 1991), Czech Republic and Slovakia (GREGOR 1997b), Switzerland (PONT & MERZ 1998) and Hungary (PAPP 2001a, b). The data for Austria are chiefly based on PONT's Catalogue (1986a) and completed by lists published by RINGDAHL (1957), FRANZ (1989), PONT (1995) and PONT & ACKLAND (1995).

GREGOR et al. (2002) summarized the faunistic data from Central European countries up to that time. In the last 12 years taxonomic and faunistic data from Central European countries have been extended as follows: Three additions to the "Muscidae of Central Europe" were published by ROZKOŠNÝ et al. (2004), GREGOR & ROZKOŠNÝ (2007b, 2009a) in which the female of *Helina balsaci* and three new species (*Spilogona angustigena*, *S. tatrca* and *Coenosia bohémica*) were described in addition to numerous new faunistic records (Germany 13 spp., Poland 13 spp., Czech Republic 27 spp., Slovakia 20 spp., Switzerland 29 spp., Austria 16 spp., Hungary 1 sp.), and one species has been proposed as a synonym (*Graphomya minor*). Data from newly published literary sources were used not only for expansion of the

faunistic records but also for the current overall geographical distribution of the individual species, which was compared with the last version of the family Muscidae in the Fauna Europaea database.

The muscid fauna of Germany was completed by SCHUMANN (2003, 2005, 2010), that of Poland by DRABER-MOŃKO (2007), GRZYWACZ (2009, 2012) and GRZYWACZ & PAPE (2010). The records from the Czech Republic were enriched by GREGOR et al. (2005), GREGOR & ROZKOŠNÝ (2006a, b, 2007a), HLAVA et al. (2012) and BARTÁK et al. (2013). Additions and corrections to the Slovak fauna were published by STRAKA & MAJZLAN (2006a, b, 2010), GREGOR & ROZKOŠNÝ (2007a), BARTÁK & ROHÁČEK (2009) and MUCHA & OBOŇA (2012). All recent data from the Czech Republic and Slovakia were included in the modern electronic checklist of the Czech and Slovak Diptera (GREGOR & ROZKOŠNÝ, 2006a, 2009b). The data from Switzerland were extended by MERZ et al. (2001, 2006, 2012), HAENNI & PONT (2008) and SOROKINA & PONT (2010), records from Germany by MENZEL & ZIEGLER (2002), and from Austria by SOROKINA & PONT (2010) and PONT (2008, 2013b).

Compared with GREGOR et al. (2002) the geographical distribution of the Central European species has been expanded following the recent reviews by SHINONAGA (2003, Japan), PONT et al. (2003, Armenia), PONT (2012, *Helina*, Caucasus), MIKHILEV & SOROKINA (2009, *Thricops* in Russia), SOROKINA & PONT (2010, Siberia) and PONT (2013b, Europe).

During preparatory studies for this manual, the authors studied extensive material collected particularly in the Czech Republic and Slovakia (National Museum Prague, Moravian Museum Brno and specimens from the collections of the authors (incl. samples from Bavaria collected by M. Barták and specimens captured in the Alps collected by F. Gregor) and those from further native colleagues J. Čepelák, J. Máca and J. Roháček. Valuable specimens were kindly sent on loan or as a gift by B. Merz (Genève).

Morphology of adults

The head (Plates 2b–c, 3a) is usually rounded anteriorly and flattened posteriorly in lateral view though mostly higher than long, rarely subquadrate (*Atherigona*, some *Limnophora*). The compound eyes are large, oval, bare or haired. The frons is broad in

all females and in the males of some species. The fronto-orbital plates of males are thus separated by a frontal vitta or touch in the middle of frons. Crossed interfrontal setae are often developed in females of the basal groups (cf. Plate 7d). The orbital setae are mostly developed as 1–2 reclinate pairs and 1 proclinate pair; the latter may be reduced in the apical groups, and the reclinate orbital setae are absent in holoptic males. The frontal setae are arranged in a longitudinal row on each fronto-orbital plate, reaching even to the level of anterior ocellus in some males. The frontal (ocellar) triangle is usually short, but is elongated to the anterior margin of frons in some species or at least in some females. The ocellar setae as well as the inner and outer vertical setae and a pair of divergent postocular setae are mostly well developed. A regular row of short postocular setae is sometimes not distinguishable from the other postocular setation. An angle between the frons and the upper face above the antennae (in lateral view) is called the prefrons here and may be slightly projecting, on the same line as the foremargin of the mouth, here or beyond it (cf. Plate 3a). Medial subtriangular plate at anterior margin of frons is called lunule.

The parafacialia are situated between the face and the eye margin. In profile the face may be straight, concave or produced beak-like. The parafacialia are bare or haired, and the vibrissal setae are located on the vibrissal angle near the lower side of head. The gena is placed below the compound eye on each side, and may bear one or more rows of upwardly curved setae.

The antenna is three-segmented, with an outer cleft on the second antennal segment (pedicel, Plate 3a) characteristic for all Calyptrata. The third antennal segment or postpedicel (= flagellomere) is mostly short and rounded, sometimes elongate and then several times as long as broad. The arista is often virtually bare but pubescent or even plumose in some species. The mouth parts are of the sucking type, and the proboscis is chiefly formed from the labium. It consists of a short or longer basal tube (prementum) and two-segmented labella. So-called pseudotracheae are visible on the inner side of the labella. The maxillary palpus is always one-segmented, conspicuously broadened in some groups (e.g. in *Lispe*, Plate 2a). The proboscis of the Stomoxyini is elongated and rigid, transformed into a piercing organ (Plate 7c). A slender and mostly shining proboscis is also

39. *Spanochaeta* STEIN (1)
 40. *Schoenomyza* HALIDAY (1)
 41. *Macrorrbis* RONDANI (1)
 42. *Coenosia* MEIGEN (51) (= *Allognota* POKORNY, *Dexiopsis* POKORNY)

Identification keys

The identification keys are essentially based on earlier European authors, especially HENNIG (1955–1964) and D'ASSIS-FONSECA (1968), though certain diagnostic characters suggested by HUCKETT (1965) and COURI & PONT (1999) are included. Keys to species have been extensively re-modelled.

The Muscidae belong to the family group Calyptrata characterized by (1) a bulbous greater ampulla in front of the wing insertion, (2) a dorsal linear seam on the pedicel, and (3) a well-developed thoracic calypter (PAPP & SCHUMANN 2000).

In the keys, different dimensions particularly on the head are often compared. The width of the ocellar triangle is given as the distance between the outer margins of the upper ocelli. The width of the frontal vitta and the inner distance between the eye margins are measured at the narrowest points, and the width of the fronto-orbital plate at the same level or (when the frons is broad) at the middle of the frons. The width of the antenna is measured as a maximum diameter of the postpedicel at its middle and the width of the parafacial at the same level. The height of the gena is the distance between the lower margin of eye and the ventral margin of the head in profile.

Key to families of Calyptrata

1. Dorsoventrally flattened flies with legs in a lateral position; coxae of middle and mostly of hind legs widely separated; ectoparasites of birds and mammals (incl. bats) **Hippoboscidae, Nycteribiidae, Streblidae**
- Not dorsoventrally flattened; legs in a normal ventral position; coxae of mid and hind legs approximated medially 2
2. Proboscis vestigial and subcranial cavity reduced **Gasterophilidae, Hypodermatidae, Oestridae**
- Proboscis developed and subcranial cavity not reduced 3
3. Meron bare or at most with sparse fine hairs 4
- Meron with distinct setae arranged in a group (Plate 6a) or vertical row 7
4. Vein A_1 reaching wing margin (Plate 6b) **Anthomyiidae** (part), **Scathophagidae**
- Vein A_1 not reaching wing margin (Plate 6d) 5
5. Thorax with a brown longitudinal midstripe on scutum and scutellum; scutellum hairy beneath at tip; frons broad in both sexes: *Anthomyia monilis* (MEIGEN, 1826) ... **Anthomyiidae** (part)
- With a different combination of characters 6
6. Vein A_2 curved forward beyond apex of A_1 and subcosta diverging from R_1 near base of both veins (Plate 6c); hind tibia with a true submedian dorsal seta (Plate 6e); katepisternals never arranged in an equilateral triangle; crossed interfrontals always absent **Fanniidae**
- Vein A_2 not curved beyond apex of A_1 (Plate 6d); if slightly so, then subcosta markedly diverging from R_1 only in distal third (Plate 6k) and hind tibia without a true submedian dorsal seta (Plate 6f); if a dorsal seta in apical third developed then katepisternals arranged at the points of an equilateral triangle (Plate 4c) **Muscidae** (part)
7. Postscutellum conspicuously swollen, markedly convex in lateral view (Plate 6h) **Tachinidae** (part)
- Postscutellum concave, flat or at most slightly convex (Plate 6g) 8
8. Vein M_1 straight (Plate 9a), cell r_{4+5} not narrowed (*Eginia ocypterata*) **Muscidae** (part)

- Vein M_1 usually upcurved, cell r_{4+5} at least slightly but usually markedly narrowed towards apex (Plate 6j), sometimes even closed (Plate 6i)
 **Calliphoridae, Rhinophoridae, Sarcophagidae, Tachinidae** (part)

Key to subfamilies and tribes

1. Vein R_1 setulose on apical third of dorsal surface (Plate 7a) and body predominantly yellow . . .
 **1. Azeliinae (Azeliini)** (part)
- R_1 bare; if setulose then body predominantly dark 2
2. Tip of scutellum reddish; cell r_{4+5} somewhat narrowed distally (Plate 7b); all coxae black; anterior katepisternal seta present **1. Azeliinae (Reinwardtiini)**
- With a different combination of characters 3
3. Inner posterior margin of hind coxa haired (cf. Plate 4a: ip) **1. Azeliinae (Azeliini)** (part)
- Inner posterior margin of hind coxa bare 4
4. Male fore femur notched and toothed at apex ventrally (Plate 7h); if fore femur simple then 0+1 or 1+1 katepisternals and radial node on wings bare, body dark with metallic shade or parafacial linear or with a row of strong frontal setae (one of two uppermost of series being longest) (Plate 7f); or with genal dilation extended close to vibrissal angle (Plate 7g). Female lower orbital seta always proclinate (Plate 7d) and anepimeron bare **1. Azeliinae (Azeliini)** (part)
- Male with different characters. Proclinate lower orbital seta in female absent, if developed then anepimeron haired 5
5. Anepimeron haired or at least with a tuft of hairs above posterior katepisternal seta (Plate 4d). 6
- Anepimeron bare 10
6. Palpus dilated spoonlike (Plate 2a); parafacial with setulae
 **5. Coenosiinae (Limnophorini)** (part)
- Palpus not dilated; if rarely broadened towards apex, then proboscis slender and shining black (Plate 7c); parafacial bare 7
7. Metathoracic spiracle with distinct setulae along lower border (Plate 7e)
 **3. Phaoniinae (Dichaetomyiini)**
- Metathoracic spiracle with bare lower border 8
8. Proboscis including labellae slender and shining black (Plate 7c), non-retractile and strongly sclerotised **2. Muscinae (Stomoxiini)**
- Proboscis not slender and shining black, flexible and retractile 9
9. All tibiae with 1 or more posteroventral setae, and arista pubescent
 **1. Azeliinae (Azeliini)** (part)
- Not all tibiae with a posteroventral seta, and arista long plumose **2. Muscinae (Muscini)**
10. Three strong katepisternal setae arranged in an inverted equilateral triangle (Plate 4c), rarely lower seta slightly closer to anterior one 11
- One to four strong katepisternal setae; if three then not arranged in an inverted equilateral triangle because lower seta closer to posterior one (Plate 4b) 14
11. Radial node setulose on both sides of wing (Plate 8 l) **5. Coenosiinae (Limnophorini)** (part)
- Radial node not setulose 12
12. Head subquadrate in profile (Plate 7i) **3. Phaoniinae (Atherigonini)**
- Head more rounded in profile 13
13. Prealar seta distinct **3. Phaoniinae (Phaoniini)** (part)
- Prealar seta absent **5. Coenosiinae (Coenosiini)** (part)
14. Two divergent proepimeral setae (Plate 43m) **5. Coenosiinae (Coenosiini)** (part)
- With a different number of proepimeral setae; if two then never divergent 15

101. Parafacial linear, narrow **399. *C. sexmaculata* MEIGEN**
 – Parafacial at middle about half as broad as postpedicel 102
102. Abdomen without paired dark spots; discal setae on dark dots (see males, couplet 12; female described by GREGOR, 1991) ***C. patelligera* RONDANI**
 – Abdomen with paired dark spots; discal setae not inserted on dark dots 103
103. Scutum with 3 distinct brown longitudinal stripes **388. *C. octosignata* RONDANI**
 – Scutum with 2 brown longitudinal stripes **400. *C. sexpustulata* RONDANI**
104. Parafacial about as broad as postpedicel or only slightly narrower; some additional setae around vibrissal seta reaching half its length **380. *C. lacteipennis* (ZETTERSTEDT)**
 – Parafacial at most half as broad as postpedicel; additional setae around vibrissal much shorter 105
105. Larger species (5.0 mm) (see males, couplet 48) ***C. comita* (HUCKETT)**
 – Smaller species (3.0–4.0 mm) 106
106. Apical section of CuA1 only slightly longer than posterior crossvein; arista hairs shorter than basal diameter of arista **362. *C. antennata* (ZETTERSTEDT)**
 – Apical section of CuA₁ about 1.5 times as long as posterior crossvein; arista hairs at least as long as basal diameter of arista 107
107. Vibrissal seta about as long as arista; hind basitarsus somewhat broader than half width of hind tibia (see males, couplet 53) ***C. vibrissata* COLLIN**
 – Vibrissal seta distinctly shorter than arista; hind basitarsus nearly as broad as hind tibia . . . 108
108. Gena distinctly broader than postpedicel; parafacial broader than anterior ocellus **406. *C. verralli* COLLIN**
 – Gena narrower than postpedicel; parafacial narrower than anterior ocellus **395. *C. pygmaea* (ZETTERSTEDT)**

Review of species

For full synonymies and references, see the catalogue by PONT (1986a)

Subfamily Azeliinae

The proclinate orbital seta in females is present (except for *Muscina*). A posterodorsal seta in the characteristic position (i.e. at the upper end of the lower third) on the hind tibia is usually well developed but absent in all species of *Azelia*, some males of *Hydrotaea* (e.g. *H. glabricula* and *H. pellucens*) and the female of *H. floccosa*. The female ovipositor is long and tubelike, sternite 8 is longitudinally divided but both its parts are well retained. The basal genera (*Azelia*, *Thricops*) bear distinct setulae on the inner posterior margin of hind coxae. Both sexes of *Drymeia* display the swollen and setose genal dilation reaching nearly the anterior margin of the head.

The majority of *Hydrotaea* males have characteristically armed fore legs in the area of tips of femora and bases of tibiae. The genus *Muscina* is considered to be a member of the tribe Reinwardtiini, and six genera form the tribe Azeliini.

Tribe Reinwardtiini

The proclinate orbitals are absent, the anepimeron is bare and cell r_{4+5} is somewhat narrowed towards the wing margin. The aedeagus is partly reduced and the aedeagal apodeme is remarkably dilated. Sternite 8 of female is reduced to two small sclerites at the posterior margin of the segment. Only one genus is widespread in Europe, but the tropical *Synthesiomyia nudiseta* (WULF, 1883) has been found in Spain, Italy, and Malta, and is also known from Egypt and Israel.

***Muscina* ROBINEAU-DESVOIDY, 1830**

Compared with the genus *Musca*, *Muscina* species show a much less narrowed cell r_{4+5} on the wing (Plate 7b) and a reddish tip of scutellum; the arista is long plumose. The male eyes are touching or narrowly separated and the male pulvilli are distinctly enlarged. The female frons is broad. The larvae live as saprophages in the early stages but chiefly as predators during the 3rd instar; some cases of parasitism on birds and man have been recorded. Four autochthonous species in Europe, and one additional species introduced from eastern Asia.

1. *Muscina angustifrons* (LOEW, 1858)

6.0–8.0 mm. Basicosta black, cell r_{4+5} only moderately narrow, vein M_1 ending below wing apex, thoracic calypter diverging from scutellum as in *M. prolapsa*. Tibiae yellow to brownish yellow, femora black. Male fronto-orbital plates touching. Female abdomen with a not very sharply shifting pattern, having a yellowish tinge. Biology unknown. East Palearctic species (eastern part of Russia, China, Korea, Japan) penetrating to the Oriental Region (S China, Vietnam, Ryukyu Is), which was surprisingly repeatedly recorded in the Czech Republic (Bohemia, Šumava Mts, see GREGOR 1997a, b, BARTÁK et al. 2004, BARTÁK et al. 2013). Probably accidentally introduced (among alien species in the Czech Republic: see ROZKOŠNÝ & GREGOR 2006), VII–I.

2. *Muscina levida* (HARRIS, 1780) (= *aspinilis* FALLÉN, 1823)

(Plate 7b)

6.0–9.0 mm. Antennae and palpi black as well as basicosta and legs. Male fronto-orbital plates contiguous or rarely narrowly separated. Larvae common in fungi (in more than 40 species, cf. DELY-DRASKOVITS & MIHÁLYI 1972) but generally in decaying organic materials (excrement of man and cattle, dead snails). Sometimes parasitizing caterpillars and causing fatal myiasis in nestling birds. Communicative hemisynanthropic, able to transfer some pathogens, though its synanthropic tendencies are not as extensive as in *M. stabulans* because it prefers mesic forest stands. Holarctic, ranging in Eurasia from Europe to Kamchatka and Japan, also Oriental Region and Hawaiian Is, V–X.

3. *Muscina pascuorum* (MEIGEN, 1826)

(Plate 10h)

7.0–11.0 mm. Antennae reddish at apex of pedicel and base of postpedicel, palpi yellow, legs completely black. Scutum without dark stripes in postsutural area even in posterodorsal view. Thoracic calypter remarkably extended, adjoining margin of scutellum (Plate 10h). Abdomen bluish grey pruinose, without a shifting pattern. Male fronto-orbital plates contiguous. Larvae in decaying materials of plant and animal origin, in fungi and caterpillars. Holarctic, distributed from Europe to Kamchatka and Japan, also in India, Pakistan, Nepal and China; in Europe more common in upland areas, VI–X.

4. *Muscina prolapsa* (HARRIS, 1780) (= *pabulorum* FALLÉN, 1817)

(Plate 10i)

6.0–10.5 mm. Antennae reddish at apex of pedicel and base of postpedicel, palpi yellow. Scutum in postsutural area with complete dark stripes best visible in posterodorsal view. Cell r_{4+5} more narrowed towards wing margin than in other species of genus. Thoracic calypter narrow, not adjoining margin of scutellum (Plate 10i), legs black. Abdomen with a shifting silvery and black pattern. Male fronto-orbital plates contiguous. Hemisynanthropic, larvae in carrion as predators of calliphorid larvae, also reared from caterpillars and larvae of bumble bees. Holarctic, distributed throughout Europe, North Africa, Palearctic Asia (to Japan), Nepal and Pakistan, V–X.

5. *Muscina stabulans* (FALLÉN, 1817)

(Plates 9j, 10d, e)

5.5–9.0 mm. Antennae reddish on the boundary between pedicel and postpedicel, palpi, basicosta, tibiae and apices of femora yellow. Male eyes separated by a frontal vitta which may be even broader than frontal triangle. Female mid and hind femora often completely yellow. Larvae in excrement of domesticated animals, man and poultry, rarely also in some cultivated plants and fungi. They may parasitize nestlings, sheep and even man. Adults eusynanthropic, transferring many pathogens from excrement and decaying materials to food as communicative endophiles. Adults overwinter. Cosmopolitan, in Central Europe up to 1500 m a.s.l., IV–XI.

Tribe Azeliini

A group of genera with a bare anepimeron (except *Drymeia cinerea*). *Azelia* is characterized by only one frontal seta in both sexes and the inner posterior margin of hind coxa is setulose as in *Thricops*. The genus *Drymeia* differs by more than 3 posterodorsals on the hind tibia and the genal dilation. The males of *Hydrotaea* possess characteristic teeth on fore femora or their body is shining black with a metallic shine. The genus *Potamia* is known by its strong upper frontal setae in males. *Achanthiptera* has vein R_1 setulose on the apical third of dorsal surface (Plate 7a) and the body predominantly yellow. The females of all genera display 1 pair of proclinate and 2 pairs of reclinate orbitals, and paired crossed or inclinate interfrontal setae (except some *Thricops* and *Drymeia tetra*). *Achanthiptera* was treated as a sole member of the separate subfamily Achanthipterinae but according to the present knowledge it is included in the tribe Azeliini as related to *Potamia*.

Azelia ROBINEAU-DESVOIDY, 1830

Small and dark species with characteristic wing venation (A_1 abbreviated and A_2 arched, Plate 6k) and mostly a characteristic pattern on the abdomen consisting of an interrupted mid stripe and paired rounded lateral spots (Plate 10n–o) (except the male of *A. aterrima*). The male frons is reduced to a triangle above antennae, the broad female frons usually bears interfrontals (Plate 7d). Male fore tarsomeres are often shortened and dilated, bearing strong apicodorsal setulae on the 4th tarsomere or short preapical dorsal spines on the 5th tarsomere, with enlarged claws and pulvilli, the outer claw sometimes longer than the inner. Mid femur with one to several strong submedian setae ventrally. Females usually smaller than their males, with paler scutum and different leg chaetotaxy. *Azelia* was formerly included in the Mydaeinae. Of the 10 Palaearctic species, 9 are known to occur in Central Europe.

6. *Azelia aterrima* (MEIGEN, 1826)

2.0–3.5 mm. Wing and calypters brown, halteres black. Male thorax and abdomen dull brownish black, only posterior margin of abdominal tergites pale dusted. *A. aterrima* is thus the sole species of the genus where the typical abdominal pattern is not developed even in the males. Male hind tibia posteroventrally with 2–4 rather long setulose hairs at apex

and anteroventrally with 2–3 shorter setae. Inner claw of fore leg shorter than outer one. Uncommon, Eurasian, in Europe from France and Romania to northern Scandinavia, also recorded from Slovakia (GREGOR et al. 2003), in Asia known from Mongolia, V–IX.

7. *Azelia cilipes* (HALIDAY, 1838)

(Plates 7d, 10c)

3.0–5.3 mm. Male black, partly pale dusted, abdomen with the typical pattern (Plate 10n), halteres yellow. Mid tibia mostly with a submedian posterior seta but without preapical dorsal seta, hind tibia with long setae on dorsal surface and posteroventrally with only a few semi-erect hairs at apex (Plate 10j). Tarsomere 3 of mid leg without fine ventral hair. Female anterior pair of tibiae yellow, thorax with distinct longitudinal stripe. Larvae in cattle excrement. Holarctic, known from southern France, Montenegro and Azerbaijan to Lapland, in Asia from Siberia, China and Japan, V–XI.

8. *Azelia gibbera* (MEIGEN, 1826)

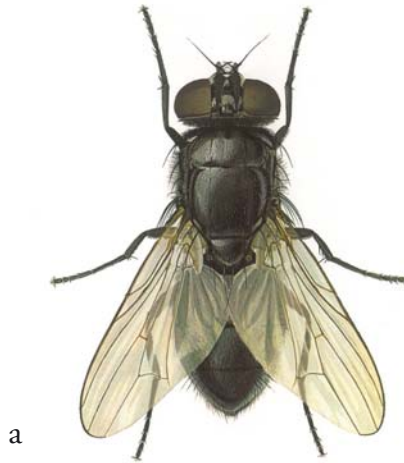
2.5–3.9 mm. Male thorax dark, brownish dusted in front of scutellum; abdominal pattern not too distinct. Halteres black, tarsomere 4 of fore leg with 2 long posterodorsal preapical setae. Mid tibia with 1 posterodorsal, hind femur with 2–4 anteroventrals, hind tibia with almost complete rows of long fine antero- and posteroventral setulose hairs. Larvae not known, adults collected on honeydew and excrement. Holarctic, in Europe from France and Bulgaria to Lapland, in Italy recorded by GREGOR et al. (2003), also in Turkey, Siberia and China, V–IX.

9. *Azelia monodactyla* LOEW, 1874

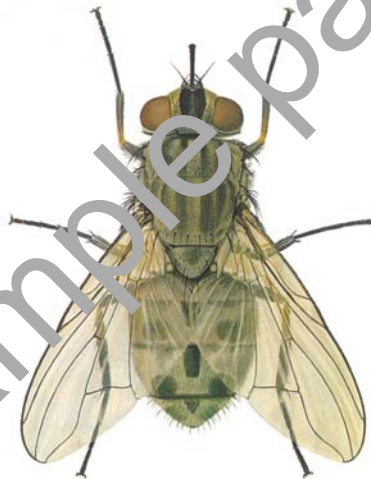
(Plate 10g, o)

2.5–2.9 mm. Body pale grey, male scutum black in front part, the typical abdominal pattern clearly visible (Plate 10 o). Wing and calypters light brownish, halteres yellow. Fore tarsus with a remarkably elongate and dilated outer claw (Plate 10g), tarsomere 4 with two close-set posterodorsal spine-like setae. Hind tibia with 1–3 anteroventral setae in males and 1 anteroventral seta in females. Adults attracted by excrement. Relatively rare Eurasian species, ranging from Bulgaria (GREGOR et al. 2003) and Central Europe to Japan, from Switzerland recorded by MERZ & PONT (2001), V–IX.

Plates



a



b

Plate 1. a – *Hydrotaea ignava*, female; b – *Stomoxys calcitrans*, female (orig. F. GREGOR).

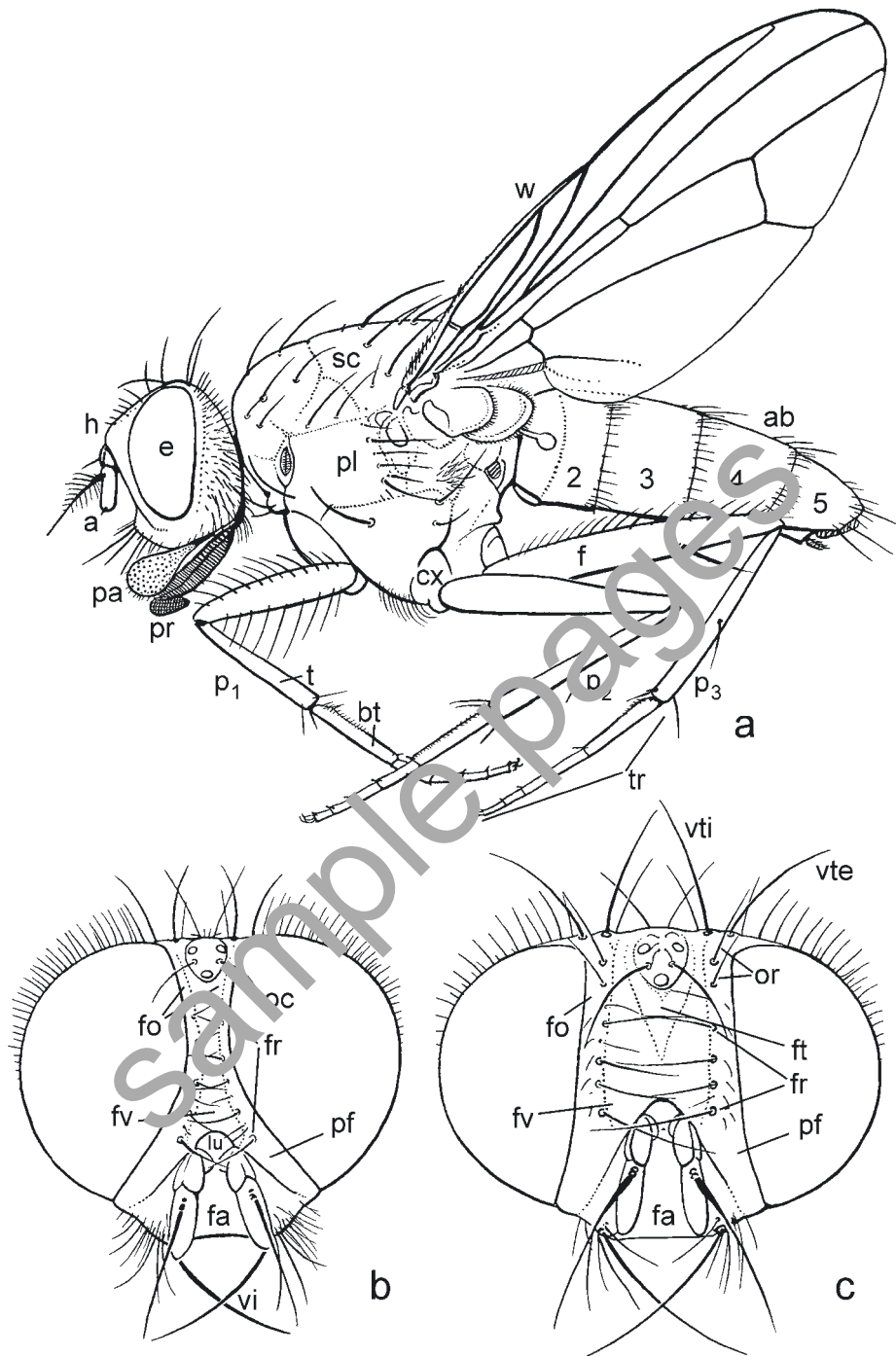


Plate 2. a – *Lispe tentaculata*, female in lateral view; b–c – *Spilogona contractifrons*, male (b) and female (c) heads in frontal view (all from ROZKOŠNÝ & GREGOR 1997).

a – antenna, ab – abdomen, e – eye, bt – basitarsus, cx – coxa, f – femur, fa – face, fo – fronto-orbital plates, fr – frontal setae, ft – frontal triangle, fv – frontal vitta, h – head, lu – lunule, oc – ocellar seta, or – orbital setae, p1–3 – fore, mid and hind legs, pa – palpus, pf – parafacial, pl – pleura, pr – proboscis, sc – scutum, t – tibia, tr – tarsus, vi – vibrissal seta, vte – outer vertical seta, vti – inner vertical seta, w – wing, 2–5 – abdominal segments.

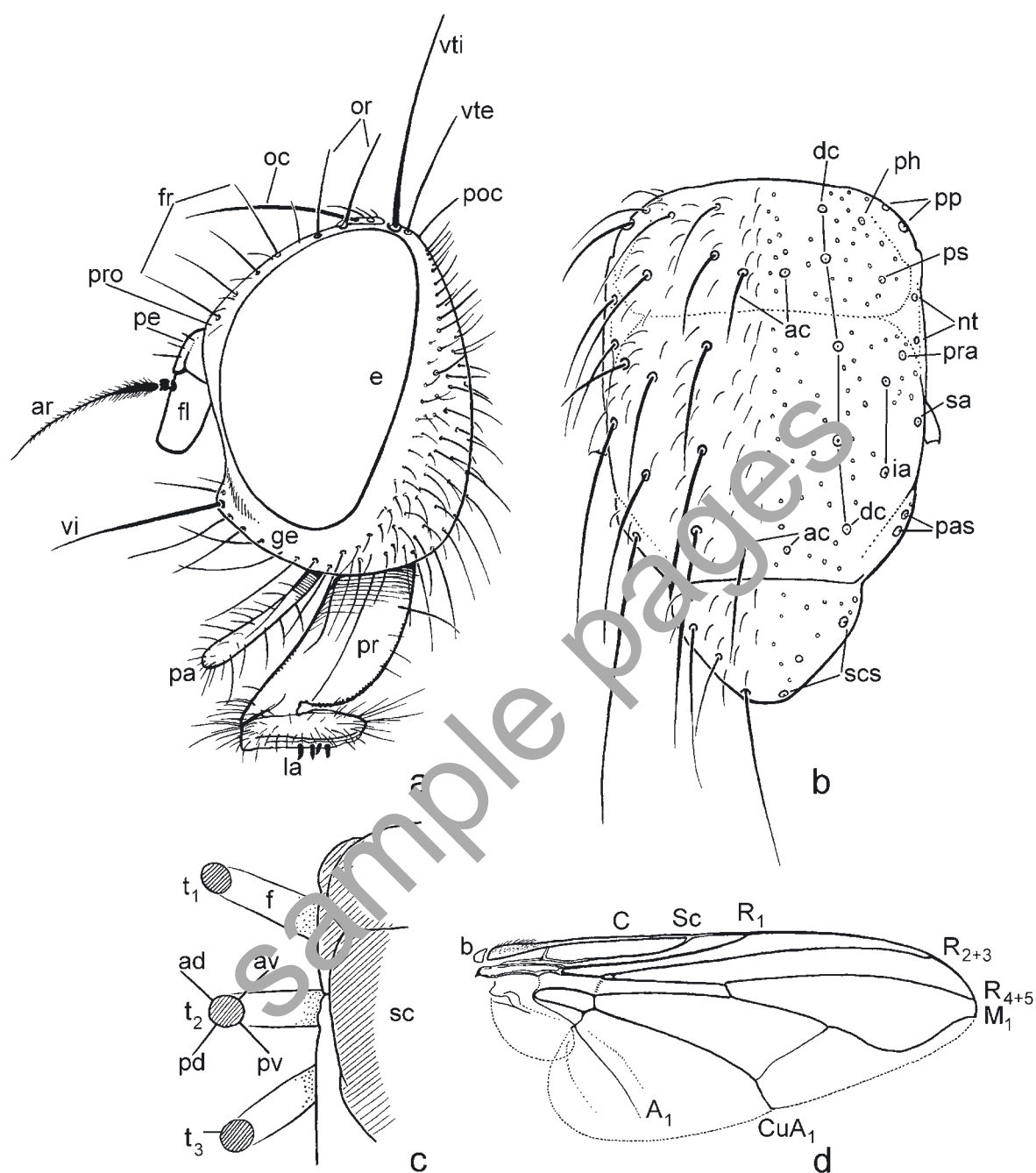


Plate 3. a – *Spilogona contractifrons*, female head in lateral view; b – general scheme of thoracic chaetotaxy; c – scheme of setae on tibia; d – *Graphomya maculata*, right wing (a, c–d from ROZKOŠNÝ & GREGOR 1997, b – orig).

ac – acrostichal setae, ad – anterodorsal seta, ar – arista, av – anteroventral seta, A₁ – anal vein, b – basicosta, C – costa, CuA₁ – cubital vein, dc – dorsocentral setae, e – eye, f – femur, face, fr – frontal setae, ge – gena, ia – intra-alar setae, la – labellum, M₁ – medial vein, nt – notopleural setae, oc – ocellar seta, or – orbital setae, pa – palpus, pas – postalar setae, pd – posterodorsal seta, pe – pedicel, ph – posthumeral seta, poc – postocelar seta, pp – postpronotal setae, ppe – postpedicel, pr – proboscis, pra – prealar seta, pro – profrons, ps – presutural seta, pv – posteroventral seta, R₁₋₅ – radial veins, sa – supra-alar seta, sc – scutum, Sc – subcosta, scs – scutellar setae, t₁₋₃ – fore, mid and hind tibia (cross sections), vi – vibrissal seta, vte – outer vertical seta, vti – inner vertical seta.

No	Species	D	PL	CZ	SK	CH	A	H	Di	Note
1	<i>Muscina angustifrons</i>			●					Ep	China, Korea, Japan
2	<i>Muscina levida</i>	●	●	●	●	●	●	●	Ho	Siberia, Orient., Hawaiian Is
3	<i>Muscina pascuorum</i>	●	●	●	●	●	●	●	Ho	Siberia, China, Orient.
4	<i>Muscina prolapsa</i>	●	●	●	●	●	●	●	Ho	Siberia, Orient., St. Helena I.
5	<i>Muscina stabulans</i>	●	●	●	●	●	●	●	Co	Siberia
6	<i>Azelia aterrima</i>	●	●	●	●	●	●	●	Ea	Mongolia
7	<i>Azelia cilipes</i>	●	●	●	●	●	●	●	Ho	Siberia, China, Japan
8	<i>Azelia gibbera</i>	●	●	●	●	●	●		Ho	Turkey, Siberia, China
9	<i>Azelia monodactyla</i>	●		●	●	●		●	Ea	Japan
10	<i>Azelia nebulosa</i>	●	●	●	●	●	●	●	Es	W Siberia
11	<i>Azelia parva</i>	●		●	●	●		●	Ea	E Siberia, Mongolia
12	<i>Azelia trigonica</i>			●			●		Sb	W Siberia, Mongolia
13	<i>Azelia triquetra</i>	●	●	●	●	●	●	●	Ho	Mongolia
14	<i>Azelia zetterstedtii</i>	●	●	●	●	●	●	●	Ho	Tajikistan, Siberia, China
15	<i>Thricops aculeipes</i>	●	●		●	●	●		Es	W Siberia
16	<i>Thricops albibasalis</i>			●					Ho	Sb in E., Siberia, Far East
17	<i>Thricops beckeri</i>	●	●	●	●	●	●		Ce	
18	<i>Thricops culminum</i>		●		●	●	●		Ce	
19	<i>Thricops cunctans</i>	●	●	●	●	●	●	●	Ea	Siberia, Japan
20	<i>Thricops diaphanus</i>	●	●	●	●	●	●	●	Ho	Turkey, Japan, Kashmir
21	<i>Thricops furcatus</i>				●	●	●	●	Ho	Siberia, Far East
22	<i>Thricops genarum</i>	●	●	●	●	●	●	●	Ea	Siberia, China
23	<i>Thricops innocuus</i>	●	●	●	●	●	●	●	Ho	Siberia, Mongolia, China
24	<i>Thricops lividiventris</i>	●		●	●	●	●	●	Ho	Eu to the Urals, China
25	<i>Thricops longipes</i>	●	●	●	●	●	●	●	Es	E Siberia
26	<i>Thricops nigrifrons</i>	●	●	●	●	●	●	●	Ea	W Siberia
27	<i>Thricops nigrifrons</i>	●	●	●	●	●	●	●	Es	Turkey, E Siberia, China
28	<i>Thricops rostratus</i>	●	●	●	●	●	●	●	Eu	to the Urals
29	<i>Thricops semicinereus</i>	●	●	●	●	●	●	●	Ea	Siberia, Mongolia, China
30	<i>Thricops separ</i>					●	●	●	Sb	Eu to the Urals
31	<i>Thricops simplex</i>				●	●	●	●	Pa	Siberia, Iraq
32	<i>Thricops sudeticus</i>	●	●	●	●	●	●	●	Eu	Turkey
33	<i>Thricops taticus</i>				●				Eu	
34	<i>Thricops villosus</i>	●				●	●		Ce	
35	<i>Drymeia alpicola</i>	●	●		●	●	●	●	Ho	Turkey, Siberia, ?China, Far East
36	<i>Drymeia brumalis</i>	●	●	●	●	●	●	●	Ea	China
37	<i>Drymeia cinerea</i>	●	●		●	●	●	●	Ce	
38	<i>Drymeia fasciculata</i>						?		Sm	Caucasus
39	<i>Drymeia hamata</i>	●	●	●	●	●	●	●	Eu	
40	<i>Drymeia tetra</i>	●	●	●	●	●	●	●	Ea	Siberia, China, Far East
41	<i>Drymeia vicana</i>	●	●	●	●	●	●	●	Ea	Siberia, Far East
42	<i>Hydrotaea aenescens</i>	●	●	●	●	●	●	●	Ho	Neotrop., Pacific Is.
43	<i>Hydrotaea albipuncta</i>	●	●	●	●	●	●	●	Ea	Siberia, China, Japan
44	<i>Hydrotaea anxia</i>	?							Ho	Sb in Eu, Siberia, Mongolia
45	<i>Hydrotaea armipes</i>	●	●	●	●	●	●	●	Ho	Siberia, Far East, Japan, Orient.
46	<i>Hydrotaea basdeni</i>	●	●			●			Ho	Siberia
47	<i>Hydrotaea borussica</i>	●	●	●	●			●	Ea	Siberia, Iran
48	<i>Hydrotaea capensis</i>	●	●	●	●	●	●	●	Co	Orient., Afr., N and S Amer.
49	<i>Hydrotaea cinerea</i>	●		●					Pa	Tunisia, Mongolia, China, Japan
50	<i>Hydrotaea cyrtoneurina</i>	●	●	●	●	●	●	●	Ea	Siberia, Mongolia, China, Korea, India
51	<i>Hydrotaea dentipes</i>	●	●	●	●	●	●	●	Ho	Siberia, N India, Nepal, Pakistan

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(Synonyms in italics, characteristics in bold, numbers with letters refer to figures)

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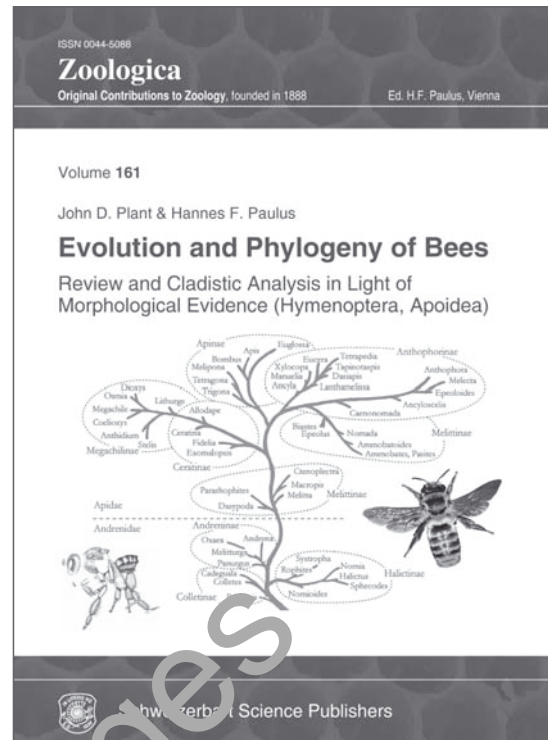
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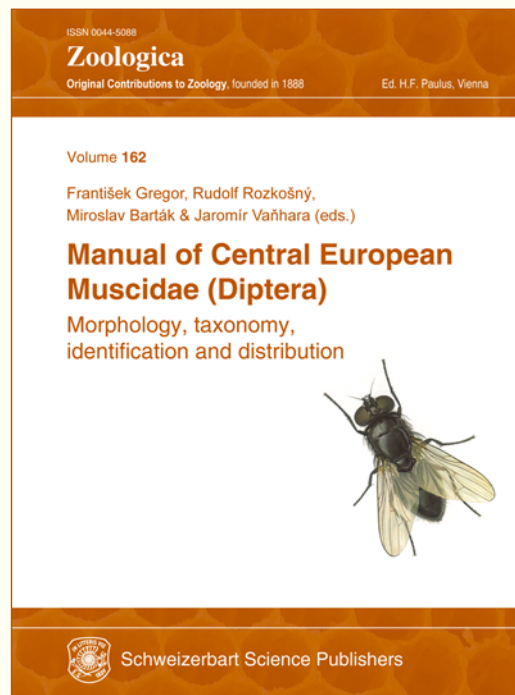
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