

**Species of the genus *Aphis* (Sternorrhyncha: Aphidoidea)
living on *Hieracium* (Asteraceae: Cichorieae)**

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**Taxonomy, *Aphis*, *Hieracium*, new species, key, *Aphis mohelnensis*, *Aphis heiei*, *Aphis curtiseta*,
morphs, host plants, distribution**

Abstract. *Aphis hieracii* Schrank (apterous and alate viviparous female, ovipara, male) is defined, along with description of three new species: *A. heiei* sp. n. (apt. and al. viv. fem.) on *Hieracium umbellatum* from Denmark, *A. curtiseta* sp. n. (apt. viv. fem., fundatrix, ovipara and male) on *Hieracium (Pilosella)* spp. from the Czech Republic, Slovakia, Bulgaria, Moldova and the Ukraine (Crimea), and *Aphis mohelnensis* sp. n. (apt. and al. viv. fem.) on *H. (P.) echioides* from the Czech Republic, *H. (P.) bauhinii* from Bulgaria and *H. virosum* from Uzbekistan. The latter species differs from *A. hieracii* in having a long ultimate rostral segment, shorter processus terminalis and, in alate females, more numerous secondary rhinaria. Additional notes on taxonomy, host plants and distribution of *A. hieracii* and *A. pilosellae* are given. Records of *Aphis fabae* s. lat. and *A. frangulae* s. lat. on *Hieracium* spp. are reviewed and a key to the seven species of *Aphis* on *Hieracium* is provided.

INTRODUCTION

The plant genus *Hieracium* L. (Asteraceae: Cichorieae: Crepidinae), is widely distributed in temperate regions of the northern hemisphere and the Andes, with the highest diversity of mostly apomictic species in the western Palaearctic. Traditionally it is subdivided in two subgenera, *Hieracium* s. str. and *Pilosella*, which in the opinion of some authors should be considered as separate genera. In the present paper the nomenclature presented in *Flora europaea*, Vol. 4 (Tutin et al., 1976) is followed.

To date 12 aphid taxa are known to be host-specific on *Hieracium*. They belong to genera *Uroleucon* (subgen. *Uroleucon*) – 4, *Nasonovia* (subgen. *Nasonovia*) – 4, *Hyperomyzus* (subgen. *Neonasonovia*) – 1, *Pleotrichophorus* – 1 and *Aphis* – 2. Except for the Canadian *Uroleucon hieracicola* (Hille Ris Lambers, 1962), these species are distributed in the western Palaearctic. Apart from this, several polyphagous or oligophagous species in the genera *Aphis*, *Aulacorthum*, *Brachycaudus*, *Nasonovia*, *Protrama*, *Trama* and *Uroleucon* have been recorded on *Hieracium* spp. The record of *Macrosiphoniella yomenae* on *Hieracium* (Pashtchenko, 1988) presumably refers to vagrant specimens, as this species lives exclusively on several genera of Astereae.

The two species of *Aphis* host-specific on *Hieracium* are *A. hieracii* Schrank, 1801 and *A. pilosellae* (Börner, 1952).

The only modern description of *A. hieracii* is that of Heie (1986) who mentioned a striking difference between samples from Denmark and Sweden in the length of hairs on antennae, femora and abdomen. A more detailed comparison with samples collected on *H. umbellatum* and related species in central and eastern Europe shows that the long-haired

Danish aphids are clearly distinct and may be treated as a separate species. On the other hand, the samples from *Hieracium* species of the subgenus *Pilosella* are, to a degree, intermediary between *A. hieracii* and *A. pilosellae* in having shorter ventral hairs and, on average, longer URS than specimens on *Hieracium* s. str. of a comparable size. I suppose that, in combination with the distinct spectrum of the host plants, these differences indicate the existence of another separate species closely related to *A. hieracii*. A third new species of the *A. hieracii*-group is characterized by a long ultimate rostral segment, relatively short processus terminalis and, in alate females, numerous secondary rhinaria. In view of the above conclusions, *A. hieracii* is redefined. Apart from this, additional data on taxonomy, previously undescribed morphs, host plants and distribution of *A. hieracii* and *A. pilosellae* are given, along with a review of the records of polyphagous *Aphis* species on *Hieracium*.

Unless otherwise stated, the collections were made by the author and the material, including the types of *Aphis curtiseta* and *A. mohelnensis*, is deposited in the Institute of Entomology, Czech Academy of Sciences. The types of *A. heiei* are in the Zoological Museum, Copenhagen, Denmark.

ABBREVIATIONS AND TERMS USED IN THE TEXT: apt. – aptera(e), apterous viviparous female(s); ovip. – ovipara; BDIII – basal (articular) diameter of antennal segment III; C – cauda; CH – number of caudal hairs; HT2 – second segment of hind tarsus measured without claws; MT – total number of marginal tubercles on abdominal segments 2–6 inclusive; S – siphunculus; S/W – ratio of length of siphunculus/width of siphunculus at half its length; THR – trochanteral hair ratio, ratio of length of ventral (posterior) hair on hind trochanter/diameter of trochantero-femoral suture. In species (or specimens) with 5-segmented antennae the antennal segments III, IV and V are homologous with segments III+IV, V and VI of normal (6-segmented) antennae, respectively. In order to avoid double and potentially misleading numbering, the segments III, IV, V and VI are defined as follows: third, fourth, penultimate and ultimate antennal segment; (III+IV) – antennal segment III in species (or specimens) with 5-segmented antennae; VIb – base of ultimate antennal segment; PT – processus terminalis of the ultimate antennal segment.

Aphis hieracii Schrank, 1861

Apterous viviparous female; spring and early summer specimens (96 specimens/17 samples)

MORPHOLOGICAL CHARACTERS. Body (1.1) 1.2–1.8 mm long. Dorsum without sclerotized areas in front of siphunculi, larger specimens sometimes with transversal bar on tergum 8 and a diffuse spinal sclerite on tergum 7. Marginal hairs on abdominal segment 3 17–25 μm , 0.8–1.3 \times BDIII, the dorsal hairs are of equal length or shorter. Frontal hairs obtuse or abruptly pointed, 12–30 μm , 0.6–2 \times BDIII, occipital hairs maximum 1.5 \times BDIII. Antennae usually 6-segmented, sometimes even large specimens with one or both antennae 5-segmented. Antennal hairs similar to the frontal ones, on segments I–II and on III 0.6–1.4 and 0.4–1.0 \times BDIII, respectively. MT = 0–9, in most samples ranging between 0–3 and rarely exceeding 4. Secondary rhinaria not developed, in alate specimens maximum 4, 3 and 1 on segments III, IV and V, respectively. Rostrum reaching to hind coxae, URS with 2 (3) accessory hairs. Siphunculi 0.09–0.18 \times body. Cauda tongue-shaped or finger-shaped, with 6–10 hairs. THR = (0.9) 1.0–1.5, longest ventral (posterior) and dorsal (anterior) hairs on hind femur 0.5–1.0 and 0.3–0.8 \times diameter of the trochantero-femoral suture, respectively. Dorsal hairs on hind tibia at half its length 0.5–1.2 \times diameter of hind tibia at half its length.

COLOUR. In life, bluish to dark green, with dark head, cauda and siphunculi; antennal flagellum pale on basal half, apically darker; tibiae pale with dark apices; tarsi dark.

Apterous viviparous female, summer dwarfs (69 specimens/4 samples)

MORPHOLOGICAL CHARACTERS. Body 0.8 to about 1.1 mm long. Dorsum without any sclerotized and pigmented areas except spiracular plates. Antennae 5-segmented or 6-segmented with segments III and IV partially fused, $0.50\text{--}0.75 \times$ body; $PT/VIb = 2.00\text{--}2.45$, $PT/(III+IV) = 0.84\text{--}1.00$. Rostrum reaching behind hind coxae, $URS/HT2 = 1.35\text{--}1.58$. Siphunculi $0.06\text{--}0.09 \times$ body, $S/C = 1.00\text{--}1.25$, $S/W = 2.7\text{--}3.5$. Cauda widely tongue-shaped, about as long as wide at base, with 5–6 hairs. Genital plate with 2 hairs on the disc and 6–8 along the hind margin. Other characters as in apterae of normal size.

COLOUR. In life, yellow or yellow-green, rarely darker. Cleared specimens brownish on the head, basal and ultimate antennal segments. Legs pale, with apices of tibiae and whole of tarsi dark. Siphunculi dark brown, sometimes with a paler zone at the base. Cauda distinctly less pigmented than the siphunculi.

Oviparous female (18 specimens/1 sample)

MORPHOLOGICAL CHARACTERS. Body 1.5–1.75 mm long. Dorsum membranous, often with fuscous marginal sclerites on thoracic segments, rarely also on abdominal segments 2–4; tergum 8 not sclerotized, with 4 hairs. Antennae $0.4\text{--}0.5 \times$ body, 5- or 6-segmented, in the latter case usually with segments III and IV partially fused. $PT/VIb = 1.7\text{--}2.4$, $PT/III+IV = 0.65\text{--}0.95$. Rostrum reaching to hind coxae, $URS/HT2 = 1.3\text{--}1.5$. Siphunculi $0.06\text{--}0.08 \times$ body, $S/W = 3.5\text{--}4.5$. Cauda tongue-shaped, about as long as wide at base, with 4–7 hairs. Genital plate pigmented only on the sides, with 13–22 hairs on anterior half and 11–16 along hind margin. Hind tibia moderately thickened on basal half, with 5–40 scent plaques. Other characters and colour as in apterae of comparable size.

Male (2 specimens/1 sample)

MORPHOLOGICAL CHARACTERS. Apterous, slightly alatform with mesothorax widened and pigmented laterally and with lateral ocelli (only traces in smaller specimen with 5-segmented antennae). Body 1.22 and 1.45 mm long. Abdominal dorsum membranous with a narrow transversal bar on tergum 8 and diffusely pigmented spinal sclerite on tergum 7; tergum 8 with 2 hairs. Antennae 0.55 and $0.67 \times$ body, 5- and 6-segmented, respectively. $PT/VIb = 2.1\text{--}2.7$, $PT/III+IV = 0.58\text{--}0.62$. Secondary rhinaria small, irregularly scattered on segments III and IV (resp. III+IV), in a row on V, 24, 15 and 5 on III, IV and V of 6-segmented antennae and 26 (32) and 5 (5) on (III+IV) and V of 5-segmented antennae. Rostrum reaching to hind coxae, $URS/HT2 = 1.25$ and 1.40 . Siphunculi about $0.08 \times$ body, $S/C = 1.4$. Cauda helmet-shaped, with 4 hairs.

COLOUR. In life, distinctly darker than the oviparae, with dark head and appendages. Cleared specimens dark brown to blackish on head, antennae, siphunculi cauda and genitalia. Legs with most part of femora, apical 1/4 of tibiae and tarsi dark brown to blackish. Other characters as in apterae.

MATERIAL EXAMINED: Germany: Pramort, nr. Stralsund, 2.vi.1957, *H. umbellatum* (apt.), leg. A. Pintera. Sweden: Lammhult Algunnen, Småland, 16.vi.1974, *Hieracium* sp. (apt., al.), leg. and det. R. Danielsson; Mora, Dalarna, 10.vii.1975, *H. umbellatum* (apt., al.), leg. and det. O. Heie. Czech Republic: Praha

(Podbaba), 17.vi.1964, *H. schmidti* (apt.); Davle, central Bohemia, 18.vii.1968, *H. umbellatum* (apt., al.); Dobřeňovice, central Bohemia, 3.vi.1971, *H. murorum* (apt.); Praha (Šárka), 19.vi.1971, *H. umbellatum* (apt.); Praha (Podolí), 18.x.1971, *H. murorum* (apt., ovip., males); Karlštejn, central Bohemia, 31.viii.1972, *H. umbellatum* (apt.); České Budějovice, southern Bohemia, 17.vi.1983, *H. umbellatum* (apt., al.); Purkarec, southern Bohemia, 16.vi.1984, *H. umbellatum* (apt.); Vranov nad Dyjí, southern Moravia, 22.viii.1993, *H. sabaudum* (apt.); Strážkovice, southern Bohemia, 15.viii.1994, *H. murorum* agg. (apt., dwarfs). Slovakia: Kozárovce, 23.vi.1966, *H. umbellatum* (apt.). Croatia: Cavtat, Dalmatia, 29.ix.1978, *Hieracium* sp. (apt.). Romania: Costesti, reg. Hunedoara, 21.vii.1976, *H. laevigatum* (apt., al.). Russia: Abramtsevo, reg. Moscow, 12.vii.1967, *H. umbellatum* (apt., al.); Moscow (Serebryanyi bor), 26.viii.1971, *H. umbellatum* (apt.). Georgia: Bethania nr. Tbilisi, 13.viii.1969, *Hieracium* sp. (apt.).

DISTRIBUTION. Central, northern and eastern Europe: Germany (Börner, 1952; Müller, 1987), Austria (Börner, 1952; Börner & Franz, 1956), Hungary (Szelegiewicz, 1968a), Romania (Holman & Pintera, 1981), Moldova (Vereshchagin et al., 1985), the Ukraine (Mamontova-Solucha, 1964), Georgia, Czech Republic and Slovakia (see above), Poland (Huculak, 1965; Szelegiewicz, 1968b), Norway (Ossiannilsson, 1962), Sweden (Ossiannilsson, 1959; Danielsson, 1974), Finland (Heie, 1966), European part of Russia (see above) and Russian Far East (Pashchenko, 1992). Introduced to North America (Smith & Paron, 1978). The record on *Leucanthemum vulgare* from W. Siberia (Ivanovskaya, 1977) evidently refers to another species.

BIOLOGY. Host plants include species of *Hieracium* s. str.: *H. argillaceum* Jordan agg. (= *lachenalii* auct.), *H. laevigatum* Willd. agg., *H. murorum* L. agg. (= *silvaticum*), *H. sabaudum* L., *H. saxifragum* Fries (Ossiannilsson, 1959, 1964), *H. schmidti* Tausch (= *pallidum*) and, most frequently, *H. umbellatum* L. (incl. subsp. *dunense* and *linariifolium* Wallr.). The record on *H. (Pilosella) aurantiacum* L. (Szelegiewicz, 1968b) and *H. (P.) pilosella* (Bozhko, 1976) might refer to *A. curtipilosa* sp. n.

According to Börner (1952), in spring, *A. hieracii* folds the lower leaves upwards. This has not been mentioned by other authors nor could be confirmed by myself. The leaves probably were deformed by *Nasonovia compositellae nigra* Hille Ris Lambers.

Aphis heiei sp. n.

Apterous viviparous female (21 specimens/3 samples)

Differs from *A. hieracii* in having long, finely pointed hairs on the body and appendages. Some differential characters were given in Heie, 1986 (parameters of the Danish *A. hieracii*). Body 1.35–1.75 mm long. Marginal hairs on third abdominal segment 60–70 μ m long, up to 3–3.5 \times BDIII, dorsal hairs about 2.5 \times BDIII. Frontal and occipital hairs 40–50 μ m and 40–45 μ m, about 2.5 \times and 2.2 \times BDIII, respectively. Antennae 0.4–0.6 \times body, hairs on segments I–II and on segment III about 1.5 and 1.2 \times BDIII, respectively. THR = 1.1–1.4, the longest hairs on ventral and dorsal sides of hind femur of about equal length, 1.2–1.4 \times diameter of the trochantro-femoral suture. Dorsal (outer) hairs on hind tibia at half its length minimum 1.2 \times diameter of the tibia at half its length. MT = 0–4. Siphunculi 0.11–0.16 \times body, S/C = 1.3–1.8. Cauda with 6–7 hairs. Other morphological characters and colour as in the apterae of *A. hieracii*.

Alate viviparous female (1 specimen)

MORPHOLOGICAL CHARACTERS. Body 1.35 mm long. Abdominal dorsum with marginal sclerites on segments 2–4, postsiphuncular sclerites, bars on terga 7 and 8 and a diffuse spinal patch on tergum 6. MT = 7. Antennae about 0.6 \times body, PT/VIB = 2.5. Secondary rhinaria 6 and 7 in a row on segment III. URS/HT2 = 1.2. S/C = 1.45. Cauda finger-shaped

with a slight constriction and with 6 hairs. Other morphological characters as in the apterae; the antennal hairs are slightly shorter.

COLOUR. Cleared specimens dark on head and thorax; antennae dark except narrow zone at base of III, the pigmented part of that segment being much darker than the remainder of the antennae. Otherwise, like the apterae.

TYPE MATERIAL: Holotype (apterous viviparous female, slide 2782bc): Blokhus, Denmark, 4.viii.1963. Paratypes: Same data, 9 apt.; Henne strand, Denmark, 1.vii.1958, 4 apt.; Holmsland, Klit, Denmark, 30.vi.1958, 7 apt. and 1 al. The types were collected by O.E. Heie.

ETYMOLOGY. Named in honour of the collector of the type material.

BIOLOGY. Presumably monoecious and holocyclic like *A. hieracii*. Lives on the stems and leaves of *H. umbellatum*, so far known only from sandy areas on the western coast of Jutland.

NOTE. In some specimens of *A. hieracii*, some, but never all, of the dorsal hairs on femora are as long as in *A. heiei*. By its chaetotaxy, the new species resembles small specimens of *Aphis fabae*, from which it differs by green colour in life, absence of sclerotization in front of the siphunculi and by number of caudal hairs (7–27, but rarely less than 12 mainly in summer dwarfs of *A. fabae*) (Heie, 1986; Stroyan, 1984).

Aphis curtiseta sp. n.

Apterous viviparous female (97 specimens/5 samples)

MORPHOLOGICAL CHARACTERS. In most parameters, the range coincides with that of normal (early summer) apterae of *A. hieracii*, the difference being mainly in the length of hairs. Body 1.05–1.70 mm long. Antennae 6-segmented, secondary rhinaria developed only in some alate specimens (up to 7 and 1–3 on segments III and IV, respectively, often present only on IV). URS/HT2 = 1.2–1.45. Caudal hairs 4–6 (7). MT = 0–2, usually 0. Hairs on tergum 3 abruptly pointed, 8–10 μ m, about 0.5–0.6 \times BDIII. Frontal and occipital hairs 8–12 (14) μ m, 0.4–0.6 \times BD III, rarely longer. Antennal hairs 8–12 μ m, on segment III maximum 0.4 \times BDIII. THR = 0.3–0.5 (0.8), longest hairs on femora 15–22 μ m, 0.3–0.5 (rarely 0.6) \times diameter of trochantero-femoral suture.

COLOUR. In life, green to dark green; appendages usually darker than in *Aphis hieracii*.

Fundatrix (1 specimen)

MORPHOLOGICAL CHARACTERS. Body widely oval, 1.7 mm long. Dorsum membranous with reticulate marginal sclerites on thoracic segments and with a faint spinal strip on tergum 8 which bears 2 hairs. Antennae 6-segmented, 0.39 \times body, PT/VIb = 1.45 and 1.70, PT(III+IV) = 0.57. Rostrum reaching to middle coxae, URS/HT2 = 1.5. Siphunculi 0.1 \times body, S/C = 1.27. Cauda 1.4 \times its basal width, with 6 hairs. Genital plate with 2 hairs on disc and 10 along the hind margin. Other characters and colour as in the apterae; length of hairs on the body and appendages is close to the lower end of the range in apterae.

Oviparous female (3 specimens/1 sample)

MORPHOLOGICAL CHARACTERS. Body 1.35 mm long; dorsum without traces of sclerotization. Antennae 5- or 6-segmented, 0.45–0.55 \times body; PT/VIb = 2.25–2.65, PT/III+IV = 0.73–0.93. Rostrum reaching far behind hind coxae, URS/HT2 = 1.58–1.72. Siphunculi

tapering, $0.06\text{--}0.09 \times$ body, $0.8\text{--}1.2 \times$ cauda. Cauda widely tongue-shaped, about as long as wide at base, with 6–10 hairs. Genital plate pigmented on the sides only, with 13–14 hairs on the disc and 15–18 along hind margin. Hind tibia moderately swollen, with 2–25 scent plaques mainly on basal half. Length of hairs as in fundatrix.

COLOUR. In life, yellowish green with dark cauda, siphunculi and tips of appendages. Cleared specimens colourless with dark apical half of antennae, tips of tibiae and whole of tarsi; siphunculi pale at base, toward apex gradually darker; cauda black-brown.

Male (2 specimens/1 sample)

MORPHOLOGICAL CHARACTERS. Apterous without any alatiform feature. Body oval, 1.1 and 1.3 mm long. Dorsum membranous except large marginal sclerites on prothorax. $MT = 0$ and 2 (on segment 6). Antennae 6-segmented with deformed junctions between segments III and IV, about $0.7 \times$ body; $PT/Vib = 2.5\text{--}3.0$, $PT/III+IV = 0.45\text{--}0.55$. Secondary rhinaria 17–22, 9–12 and 2–5 on segments III, IV and V, respectively. Rostrum reaching behind hind coxae, URS about $1.6 \times HT2$. Siphunculi cylindrical, $0.08\text{--}0.09 \times$ body, $1.05\text{--}1.3 \times$ cauda which bears 7 hairs. Colour as in males of *A. hieracii*.

TYPE MATERIAL: Holotype (apt. viv. fem., slide no. 3098/apt. 1): Horša nr. Levice, Slovakia, 5.v.1960, *Hieracium (Pilosella) piloselloides*. Paratypes: Same data, 11 apt., 1 fund.; Luka pod Medníkem, C. Bohemia, Czech Republic, 30.ix.1964, *H. (P.) fallax*, 7 ovip., 2♂; Belogradchik, reg. Vidin, Bulgaria, 2.xi.1990, *H. (P.) bauhinii* agg., 12 apt.; Bodrost, cca 15 km E of Blagoevgrad, Bulgaria, 8.vi.1990, *H. (P.) bauhinii* agg., 45 apt.; Ataki, Moldova, 25.v.1972, *H. (P.) caespitosum* agg., 13 apt., leg. P. Starý; Angarskyi pereval (Angara Pass) cca 12 km N. of Alushta, Crimea, Ukraine, 13.ix.1961, *Hieracium (P.)* sp., 16 apt.

ETYMOLOGY. Short haired in Latin.

DISTRIBUTION. Czech Republic, Slovakia, Bulgaria, Moldova, the Ukraine.

BIOLOGY. Host plants include *Hieracium (Pilosella)* sp., *H. (P.) bauhinii* agg., *H. (P.) caespitosum* agg., *H. (P.) fallax* Willd., *H. (P.) piloselloides* Vill.

Monoecious, holocyclic. Lives mostly on the basal parts of the host plants; in early summer also in the inflorescences. Ant-attended.

NOTE. The extreme variants of hair lengths in *A. hieracii* and *A. curtiseta* are close to each other or partly overlap. If available, more than one specimen of each sample should be checked. The systematic position of the host plant may not be an absolutely reliable discriminative feature of the two species (cf. host-plants of *A. pilosellae*).

Aphis mohelnensis sp. n.

Apterous viviparous female (192 specimens/5 samples)

MORPHOLOGICAL CHARACTERS. 1.18–1.93 mm. Abdominal dorsum membranous, sometimes (mainly in alatiform specimens with secondary rhinaria) small, diffuse and often broken marginal sclerites are present on abdominal segments 2–4. A spinal sclerite on tergum 7 and a narrow transversal bar on tergum 8 are developed to various degree. Dorsal hairs acute, 20–25 μ m long, on abdomen usually with one pair in addition to the marginal hairs (the latter 1, 2–3, 2–3, 1–2, 1, 1 and 1 on segments 1–7, respectively); tergum 8 with 2 hairs. Ventral hairs finely pointed, $2.0\text{--}2.5 \times$ BDIII. Marginal tubercles small, present on prothorax and abdominal segments I and VII. Antennae 5- or 6-segmented, $0.33\text{--}0.65$ of the body length. Processus terminalis $1.4\text{--}2.2$ (rarely more than 2) \times Vib. Secondary

rhinaria not developed in true apterae, alatiform specimens with 0–4 rhinaria on III–V. Longest hair on III 0.5–0.8 × BDIII. Rostrum reaching to or slightly behind hind coxae. URS slender, 3.3–4.0 × its maximum width, 1.55–2.00 × HT2, with 2 (3) hairs in addition to the three apical pairs. Siphunculi 0.10–0.17 of the body length. Cauda finger-shaped, usually slightly constricted, with 4–6 (7) hairs. Genital plate with 2 long hairs on anterior half and 6–9 along hind margin. THR = 0.8–1.2. Longest posterior (ventral) and anterior (dorsal) hairs on hind femur 0.8–1.3 and 0.4–0.6 × diameter of the trochantro-femoral suture, respectively. First tarsal segments with 3, 3, 2 hairs. HT2 with 0 or 1 hair in addition to the three apical pairs.

COLOUR IN LIFE. Bluish green (alatiform specimens darker), with dark head, siphunculi, cauda, apical parts of the antennae and apices of the legs. In cleared specimens, head and antennal segments I–II dark, antennal flagellum pale basally, distal half gradually darker. Legs pale with dark coxae, tips of tibiae, whole of tarsi and usually with the femora distally darker. Siphunculi, cauda and anal plates nearly black.

Alate viviparous female (36 specimens/5 samples)

MORPHOLOGICAL CHARACTERS. Abdominal dorsum with large marginal sclerites on segments 2–4, small ones on 5; large postsiphuncular sclerites, spinal bars on terga 6–7; and transversal bar on tergum 8. Antennae 6-segmented, 0.55–0.70 × body. Processus terminalis 1.8–2.7 × VIb. Secondary rhinaria of unequal size, with wide rims, 9–26 irregularly scattered on segment III, 3–12 on IV and (0) 1–7 in one row on segment V. Siphunculus 1.40–1.95 × cauda. Otherwise, as in the apterae.

COLOUR. In life, black with dark appendages and a green abdomen. Cleared specimens blackish on the head, thorax, siphunculi and cauda. Antennae nearly as dark as the head, with the base of segment III paler.

TYPE MATERIAL. Holotype (apt. viv. fem., slide 18 499–500, apt.): Mohelno, southern Moravia, Czech Republic, 23.vi.1984, on *H. (P.) echioides*. Paratypes: Same data, 60 apt. and 14 al.; Ibid., 13.vi.1995, on *H. (P.) echioides*, 70 apt. and 5 al.; Sandanski, Bulgaria, 25.v.1990, on *Hieracium (Pilosella)* sp., 2 apt. and 1 al.; Blagoevgrad, Bulgaria, 8.vi.1990, on *H. (P.) bauhinii*, 18 apt. and 7 al.; Sydzhak, reg. Tashkent, Uzbekistan, 4.vi.1976, on *H. virosum*, 41 apt. and 9 al.

ETYMOLOGY. The species name is based on the type locality (Mohelno).

BIOLOGY. Lives on the terminal parts of the plants, mainly in the inflorescences. Presumably holocyclic and monoecious like related species. Known host plants include *Hieracium (Pilosella) echioides* (Lumnitzer) F.W. et C.H. Schultz, *H. (P.) bauhinii* agg. and *H. virosum* Pall.

SYSTEMATIC POSITION. *Aphis mohelnensis* sp. n. is related to *A. hieracii* from which it differs in having longer URS, both absolutely (0.125–0.160 mm versus 0.940–0.125 mm) and relatively (1.55–2.00 versus 1.05–1.50 × HT2). The alatae of *A. mohelnensis* usually have more numerous secondary rhinaria (9–26 on segment III, 3–16 on IV and 0–7 on V compared with 5–10, 0–3 and 0–1, respectively, in alatae of *A. hieracii*) which on segments III and IV are irregularly distributed in *A. mohelnensis* and nearly in a row in *A. hieracii*.

NOTE. *H. virosum*, the host plant of the two samples from Uzbekistan, is a robust species of *Hieracium* s. str., whereas the European samples were collected on relatively tiny plants of the subgen. *Pilosella*. The aphids from Uzbekistan are distinctly larger (apterae 1.42–1.93 mm versus 1.18–1.44 mm, alatae 1.45–1.80 mm and 1.05–1.33 mm, respectively), with slightly shorter antennae, processus terminalis and URS (URS/HT2 =

1.57–1.83 versus 1.65–2.00). The alatae from Uzbekistan have more numerous secondary rhinaria (15–26 versus 9–16 on III, 6–12 versus 3–7 on IV and 3–7 versus 0–3 on V). These characters are size-dependent and the above differences correspond to expectations. The body size in aphids to some degree reflects the size of the host-plant and usually decreases dramatically later in the season. In view of this, I do not see at present any reason for treating the aphids from *H. virosum* as a separate species.

Aphis pilosellae (Börner, 1952)

Apterous viviparous female (98 specimens/17 samples)

A detailed description of both normal (spring and early summer) and dwarfish (mid-summer) apterae is given in Heie, 1986. The main parameters of the studied specimens nearly fully coincide with those of normal apterae and only a few data are to be corrected. In some samples, up to 40 percent of the medium-sized specimens (1.25–1.50 mm) have one or both antennae 4-segmented. PT/VIb = 1.45–2.30, PT/(III+IV) = 0.70–1.15, URS/HT2 = 1.5–2.0, URS/S = 0.8–1.4. For other measurements, see Table 1, column 3.

TABLE 1. Main characteristics of apterous viviparous females and number of secondary rhinaria in alate viviparous females (alatae) of *Aphis* spp. living on *Hieracium*: *A. hieracii*, *A. mohelnensis* and *A. pilosellae*.

<i>Aphis</i> species	<i>A. hieracii</i> s. str.*	<i>A. mohelnensis</i>	<i>A. pilosellae</i>
Specimens/samples measured	96/17	192/6	98/17
Length (mm) of			
Body	1.100–1.780	1.150–1.940	1.045–1.620
Ant.	0.560–1.050	0.440–0.900	0.545–0.860
VIb	0.065–0.105	0.060–0.110	0.065–0.105
PT	0.140–0.230	0.110–0.165	0.125–0.215
URS	0.095–0.125	0.125–0.160	0.125–0.165
HT2	0.065–0.100	0.070–0.100	0.070–0.095
Ratio			
Body/Ant.	0.46–0.77	0.29–0.58	0.42–0.56
URS/HT2	1.08–1.40	1.57–2.00	1.51–1.97
URS/VIb	1.03–1.55	1.48–2.13	1.50–1.91
PT/VIb	1.70–2.55	1.30–2.12	1.42–2.24
PT/URS	1.55–1.85	0.80–1.10	0.95–1.30
S/C	1.00–1.70	1.25–1.80	0.85–1.65
THR	0.90–1.50	0.80–1.20	0.20–0.40
Number of			
MT	0–9	0	0–3(7)
CH	6–10	4–6(7)	6–9
Sec. rhin. in alatae on III	5–10	9–26	7–16*
IV	0–3	3–12	0(1)
V	0–1	0–7	0

* Spring and early summer specimens; for smaller specimens see description.

Fundatrix (34 specimens/3 samples)

MORPHOLOGICAL CHARACTERS. The studied specimens show a somewhat larger range of variability than given in the short descriptions by Hille Ris Lambers (1956) and Heie

(1986). Measurements (in mm): Body 1.35–1.67, (III+IV) 0.185–0.295, VIb 0.085–0.105, PT 0.125–0.165, URS 0.135–0.165, S 0.155–0.215. Antennae 0.4–0.5 of the length of body, 5-segmented. Ratio PT/VIb = 1.3–1.8, PT/URS = 0.75–1.05, S/HT2 = (1.7) 2.0–2.5, MT = 0–1. Like in most other *Aphis* species, the fundatrices have relatively shorter PT and longer antennal segment III (or III+IV) than apterous viviparous females. Therefore, for discrimination of the two morphs, the most reliable ratio is PT/(III+IV): 0.47–0.63 and 0.65–1.28 in fundatrices and apt. viv. fem. of *A. pilosellae*, respectively, smaller only in large apterous viviparae with segment (III+IV) longer than 0.170 mm and PT longer than 0.3 mm. Other characters and colour as in apt. viv. fem. of a comparable size.

Oviparous female (3 specimens/1 sample)

MORPHOLOGICAL CHARACTERS. Body length 0.95–1.10 mm. Dorsum membranous, MT = 0–1, tergum 8 with 4–5 hairs. Antennae 5-segmented, 0.42–0.48 of the body. PT/VIb = 1.75–2.00, PT(III+IV) = 0.9–1.1, PT/URS = 0.95–1.10. Rostrum reaching to the middle of abdomen, URS/HT2 = 1.80–2.03. Siphunculi about 0.06 of the length of body, cylindrical, about as wide as hind tibia or thinner; S/C = 0.7–0.8, S/HT2 = 0.9–1.0. Cauda helmet-shaped, with 6–7 hairs. Genital plate oval, in the middle colourless, with 8 hairs on the anterior half and 8–9 along the hind margin. Hind tibiae are at the most only slightly thickened, if at all, with 0–6 relatively large scent plaques.

COLOUR. In life, yellow to yellow-green. Cleared specimens dusky on head, basal antennal segments, distal half of antennal flagellum, femora, apices of the tibiae and on tarsi; siphunculi nearly colourless at base, toward apex gradually darker. Cauda dark.

MATERIAL EXAMINED: Czech Republic: Valdice near Jičín, east Bohemia, 24.viii.1956, *H. (P.) pilosella* (apt.); Luka pod Medníkem, central Bohemia, 24.v.1964, *H. (P.) pilosella* (apt., al.); Srbsko u Berouna (Koda), central Bohemia, 14.v.1958, *H. (P.) caespitosum* (fund.); Dobřejovice, central Bohemia, 7.vi.1970 and 5.vi.1971, *H. murorum* (apt., al.); Pohoží na Šumavě, south Bohemia, 28.vi.1970, *H. (P.) pilosella* (apt., al.); Karlštejn, central Bohemia, 31.viii.1972, *H. (P.) echioides* (apt.); Modlešovice nr. Strakonice, south Bohemia, 23.v.1984 and 16.v.1989 (fund., apt., al.), *H. (P.) pilosella*; Slapy, central Bohemia, 26.v.1984, *H. (P.) pilosella* (apt., al.); Bzenec, south Moravia, 30.iv.1987, *H. (P.) pilosella* (apt., al.). Slovakia: Kamenica nad Hronom, south Slovakia, 21.x.1961, *H. (P.) pilosella* (oviparae) and 26.vi.1984, *H. (P.) macrantha* (apt.); Nová Bašta, 24.v.1967, *H. (P.) pilosella* (apt.), Teplý Vrch nr. Rimavská Sobota, central Slovakia, 6.vii.1989, *H. (P.) pilosella* (apt.). Bulgaria: Belogradchik, reg. Vidin, 2.–4.vi.1990, *H. (P.) pilosella* (apt., al.). Russia: Abramtsevo, reg. Moscow, 27.vii.1967 and 23.vii.1969, *H. (P.) caespitosum* agg. (apt.); Luzhki nr. Serpukhov, reg. Moscow, 20.vii.1971, *H. (P.) pilosella* (apt.).

DISTRIBUTION. Most of Europe, in warmer regions rare or absent: Spain (Nieto Nafria et al., 1984) France (Leclant, 1978), Great Britain (Stroyan, 1984), Netherlands (Hille Ris Lambers, 1956), Germany and Austria (Börner, 1952), Poland (Huculak, 1965; Szelegiewicz, 1964; Czylok et al., 1982), Denmark, Norway and Sweden (Heie, 1986), Finland (Albrecht, 1993), Ukraine (Mamontova-Solucha, 1964; Holman, 1961), Russia (see above).

HOST PLANTS. Usually *Hieracium (Pilosella) pilosella* L. and frequently also related species of the same subgenus: *H. (P.) aurantiacum* L. (Börner, 1952; Börner & Franz, 1956; Achremowicz, 1975), *H. (P.) caespitosum* agg., *H. (P.) echioides* L. and *H. (P.) macranthum* (Ten.) Ten. Rarely on *Hieracium* s. str.: *H. murorum* agg. and *H. bupleuroides* C. C. Gmelin (Leclant, 1978). Records on *Andryala integrifolia* L. and *A. ragusina* L. (Nieto Nafria et al., 1984) refer to another taxon similar to *A. pernilleae* (Nieto, pers. comm.).

NOTE. Among European species of the genus *Aphis*, *A. pilosellae* is considered to be one of the few very distinctive species. It is easily recognizable by its long URS in

combination with very short hairs and consistently 5-segmented antennae in both apterous and alate viviparous females. Recently, very similar taxa have been discovered on the roots of *Hypochoeris* (*A. pernilleae* Heie, 1986) and on *Andryala* spp. (originally reported as *A. pilosellae*, see above). The specimens from *Andryala* differ in having the ventral hairs more finely pointed (THR = 0.6–0.8) and URS on average shorter (URS/HT2 = 1.4–1.6). The distinction between *A. pernilleae* and *A. pilosellae* is questionable. The ranges of differential characters of *A. pernilleae* given by Heie (ratio S/HT2, diameter of marginal tubercle on abdominal segment 7, pigmentation of cauda and ratio maximum width/length of URS) and those of studied specimens *A. pilosellae* of comparable size widely overlap.

Aphis fabae Scopoli, 1763 s. lat.

This polyphagous species sometimes infests *Hieracium* in late spring and early summer, and develops on it one or more generations. Most published records originate from Romania (RO; Holman & Pintera, 1981) and the Botanical garden in Prague (CZ; Holman, 1991): *Hieracium argillaceum* agg. (= *lachenalii* auct.) (CZ), *H. bifidum* Kit. (RO), *H. (Pilosella) cymosum* L. (CZ), *H. lanatum* Vill. (CZ, RO), *H. schmidti* Tausch. (= *pallidum* Biv.) (CZ), *H. sabaudum* L. (CZ), *H. virosum* Pallas (RO). Additional records from Czech Republic: *H. (P.) aurantiacum* L., České Budějovice, southern Bohemia, 7.vi.1996; *H. laevigatum* agg., Lazec nr. Č. Krumlov, southern Bohemia, 9.vii.1995; *H. murorum* L. Strážkovice, southern Bohemia, 29.v.1998.

Aphis frangulae Kaltenbach, 1845 complex

A. frangulae complex comprises taxonomically difficult taxa treated as subspecies or species, among others *A. gossypii*, which is the most polyphagous, cosmopolitan aphid. Curiously, the only published record on *Hieracium* is on *H. (P.) pilosella* (Wood-Baker, 1980 as *A. gossypii*).

MATERIAL EXAMINED: Two samples collected on *H. virosum* L. in Uzbekistan, reg. Tashkent: Chum-san, 1.vi.1976 (apt., al.) and Sydzhak, 4.vi.1976 (apt.).

NOTE. The aphids differ from European taxa of the *A. frangulae* complex in having short processus terminalis (1.6–2.0 and 1.7–2.3 in apterae and alatae, respectively) and relatively short URS (0.85–1.05 × HT2). A more detailed classification requires data on other morphs (sexuales) and the cycle of generations.

Key to apterous viviparous females of *Aphis* spp. living on *Hieracium*

- 1 Cauda with 7–24 (rarely less than 12) hairs. Colour in life black or very dark brown *A. fabae* Scopoli
- Cauda with 4–10 hairs. Colour in life from dark green, bluish green to light green or yellowish 2
- 2 PT/URS = 0.8–1.3, URS/HT2 = 1.5–2.0 3
- PT/URS = 1.4–2.1, URS/HT2 = 0.95–1.50, rarely more in some mid-summer dwarfish specimens . . 4
- 3 THR = 0.2–0.4. Ventral abdominal hairs about equal to BDIII or shorter. Both apterae and alatae consistently with 5-segmented antennae *A. pilosellae* (Börner)
- THR = 0.8–1.4. Ventral abdominal hairs distinctly longer than BDIII. Apteræ usually and alatae always with 6-segmented antennae *A. mohelnensis* sp. n.
- 4 URS about as long as HT2 or shorter. Cauda distinctly paler than siphunculi *A. frangulae* (on *H. virosum*)

- URS distinctly longer than HT2. Cauda usually as dark as siphunculi or nearly so 5
- 5 THR = (0.9) 1.0–1.5. Hairs on antennal segment III 0.5–1.2 × BDIII, rarely shorter. On *H. umbellatum* and some other species of *Hieracium* s. str. 6
- THR = 0.3–0.5 (0.8). Hairs on antennal segment III maximum 0.4 × BDIII *A. curtiseta* sp. n.
- 6 Hairs on tergum 3 maximally 25 µm long, about 1.3 × BDIII. Longest dorsal (anterior) and ventral (posterior) hairs on hind femur 0.3–0.8 and 0.5–1.0 × diameter of trochantero-femoral suture, respectively *A. hieracii* Schrank
- Hairs on tergum 3 about 50–70 µm long, 2.5–3.5 × BDIII. Longest dorsal and ventral hairs on hind femur of about equal length, 1.2–1.4 × diameter of trochantero-femoral suture *A. heiei* sp. n.

Host records of *Aphis* spp. on *Hieracium*

<i>Hieracium argillaceum</i> agg. (= <i>lachenalii</i>)	<i>Aphis fabae</i> , <i>A. hieracii</i>
<i>Hieracium bupleuroides</i>	<i>Aphis pilosellae</i>
<i>Hieracium bifidum</i>	<i>Aphis fabae</i>
<i>Hieracium laevigatum</i>	<i>Aphis fabae</i> , <i>A. hieracii</i>
<i>Hieracium lanatum</i>	<i>Aphis fabae</i>
<i>Hieracium murorum</i> (= <i>silvaticum</i>)	<i>Aphis fabae</i> , <i>A. hieracii</i> , <i>A. pilosellae</i>
<i>Hieracium sabaudum</i>	<i>Aphis fabae</i> , <i>A. hieracii</i>
<i>Hieracium saxifragum</i>	<i>Aphis hieracii</i>
<i>Hieracium schmidti</i> (= <i>pallidum</i>)	<i>Aphis fabae</i> , <i>A. hieracii</i>
<i>Hieracium umbellatum</i>	<i>Aphis heiei</i> , <i>A. hieracii</i>
<i>Hieracium virosum</i>	<i>Aphis fabae</i> , <i>A. frangulae</i> compl., <i>A. mohelnensis</i>
<i>Hieracium</i> (<i>Pilosella</i>) sp.	<i>Aphis curtiseta</i>
<i>Hieracium</i> (<i>P.</i>) <i>aurantiacum</i>	<i>Aphis fabae</i> , <i>A. pilosellae</i>
<i>Hieracium</i> (<i>P.</i>) <i>bauhinii</i>	<i>Aphis curtiseta</i> , <i>A. mohelnensis</i>
<i>Hieracium</i> (<i>P.</i>) <i>caespitosum</i>	<i>Aphis curtiseta</i> , <i>A. mohelnensis</i>
<i>Hieracium</i> (<i>P.</i>) <i>cymosum</i>	<i>Aphis fabae</i>
<i>Hieracium</i> (<i>P.</i>) <i>echioides</i>	<i>Aphis mohelnensis</i> , <i>A. pilosellae</i>
<i>Hieracium</i> (<i>P.</i>) <i>fallax</i>	<i>Aphis curtiseta</i>
<i>Hieracium</i> (<i>P.</i>) <i>macranthum</i>	<i>Aphis pilosellae</i>
<i>Hieracium</i> (<i>P.</i>) <i>pilosella</i>	<i>Aphis curtiseta</i> , <i>A. pilosellae</i>
<i>Hieracium</i> (<i>P.</i>) <i>piloselloides</i>	<i>Aphis curtiseta</i>

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REFERENCES

- ACHREMOWICZ J. 1975: Pochodzenie, struktura i przemiany fauny mszyc (Homoptera, Aphidodea) niziny Wielkopolsko-kujawskiej. [Origin, structure and changes of the aphid fauna (Homoptera, Aphidodea) of the Great Poland-Kujawy Lowland.] *Zesz. Nauk. Akad. Rol. Kraków* **101**: 1–116 (in Polish).
- ALBRECHT A. 1993: *Aphis* species new to Finland (Homoptera, Aphididae, Aphidinae). *Entomol. Fenn.* **4**: 11.
- BÖRNER C. 1952: Europae centralis Aphides. *Mitt. Thüring. Bot. Ges. (Weimar)* **3**: 1–484.
- BÖRNER C. & FRANZ H. 1956: Die Blattläuse des Nordostalpengebietes und seines Vorlandes. *Österr. Zool. Z. (Wien)* **6**: 297–411.
- BOZHKO M.P. 1976: *Tli kormovykh rastenij. (Aphids of the Host-Plants.)* Vishtcha Shkola, Kharkov, 134 pp. (in Russian).
- CZYŁOK A., WOJCIECHOWSKI W., KOSONOCKA L. & SEGET A. 1982: Fauna mszyc (Homoptera, Aphidodea) zbiorowisk roślinnych okolic Dolistowa nad Biebrzą. [Aphid fauna (Homoptera, Aphidodea) of phytocenoses in the vicinity of Dolistów nad Biebrzą.] *Acta Biol. Univ. Śląsk.* **505**: 36–49 (in Polish).

- DANIELSSON R. 1974: New records of Swedish aphids (Hem. Hom. Aphidoidea). *Entomol. Tidskr.* **95**: 64–72.
- HEIE O.E. 1966: Aphids collected in Finland during the 12th NJF Congress in 1963. *Ann. Entomol. Fenn.* **32**: 113–127.
- HEIE O.E. 1986: The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. III. Family Aphididae: subfamily Pterocommatinae and tribe Aphidini of subfamily Aphidinae. *Fauna Entomologica Scandinavica*. 17. E.J. Brill, Leiden-Copenhagen, 314 pp.
- HILLE RIS LAMBERS D. 1956: On aphids from the Netherlands with descriptions of new species (Aphididae, Homoptera). *Tijdschr. Entomol.* **98**: 229–249.
- HOLMAN J. 1961: (Contribution to the study of the aphid fauna of the fam. Aphididae of southern and moutain part of Crimea.) *Acta Faun. Entomol. Mus. Nat. Pragae* **7**: 109–128 (in Russian, English abstr.)
- HOLMAN J. 1991: Aphids (Homoptera, Aphidoidea) and their host plants in the botanical garden of Charles University in Prague. *Acta Univ. Carol. (Biol.)* **35**: 19–55.
- HOLMAN J. & PINTERA A. 1981: Übersicht der Blattläuse (Homoptera, Aphidoidea) der Rumänischen Sozialistischen Republik. *Studie ČSAV (Prague)* 15. Academia, Praha, 125 pp.
- HUCULAK S. 1965: Mszyce (Homoptera, Aphidoidea) Pojezierza Mazurskiego. [Aphids (Homoptera, Aphidoidea) of the Mazurian Lakeland.] *Fragm. Faun. (Warszawa)* **12**: 207–237 (in Polish, German and Russian abstract).
- IVANOVSKAYA O.I. 1977: *Aphids of the Western Siberia. I–II*. Nauka, Novosibirsk, 326 pp. (in Russian).
- LECLANT F. 1978: *Étude bioécologique des Aphides de la région méditerranéenne. Implications Agronomiques*. Acad. Montpel., Univ. Sci. Techn., Languedoc, 318 pp.
- MAMONTOVA-SOLUCHA V.O. 1964: (Aphids of the Ukrainian Forestland.) *Praci Inst. Zool.* **20**: 52–72 (in Ukrainian).
- MÜLLER F.P. 1987: Faunistisch-ökologische Untersuchungen über Aphiden im westlichen Erzgebirge und Vogtland (Insecta, Homoptera, Aphidina). *Faun. Abh. Mus. Tierk. Dresden* **14**: 105–129.
- NIETO NAFRÍA J.M., DÍAZ GONZÁLEZ T.E. & MIER DURANTE M.P. 1984: *Catálogo de los pulgones (Homoptera, Aphidoidea) de España*. Universidad de León, León, 174 pp.
- OSSIANNILSSON F. 1959: Contributions to the knowledge of Swedish aphids. II. List of species with find records and ecological notes. *K. Lantbrhögsk. Ann. (Uppsala)* **25**: 375–527.
- OSSIANNILSSON F. 1962: Hemiptefynd i Norge 1960. (Hemiptera findings in Norway 1960.) *Norsk. Entomol. Tidsskr.* **12**: 56–62.
- OSSIANNILSSON F. 1964: Contributions to the knowledge of Swedish aphids. III. List of food plants. *K. Lantbrhögsk. Ann. (Uppsala)* **30**: 435–464.
- PASHTCHENKO N.F. 1988: Suborder Aphidinea – Aphids. In Ler P.A. (ed.): *Keys to Insects of the Far East of USSR. Vol. 2*. Nauka, Leningrad, pp. 546–686 (in Russian).
- PASHTCHENKO N.F. 1992: Aphids of the genus *Aphis* (Homoptera, Aphidinea, Aphididae), living on plants of the family Asteraceae in the Russian Far East. *Zool. Zh.* **71**: 32–51 (in Russian).
- SMITH C.F. & PARRON C.S. 1978: An annotated list of Aphididae (Homoptera) of North America. *N. Carol. Agric. Exp. Sta. Tech. Bul. No 255*: 428 pp.
- STROYAN H.L.G. 1984: Aphids – Pterocommatinae and Aphidinae (Aphidini). Homoptera, Aphididae. *Handbooks for the Identification of British Insects* 2, Part 6. Royal Entomol. Soc., London, 232 pp.
- SZELEGIEWICZ H. 1964: Mszyce (Homoptera: Aphididae) doliny Nidy. [Aphids (Homoptera, Aphididae) of the Nida valley.] *Fragm. Faun.* **11**: 233–255 (in Polish).
- SZELEGIEWICZ H. 1968a: Faunistische Übersicht der Aphidoidea (Homoptera) von Ungarn. *Fragm. Faun.* **15**: 57–98.
- SZELEGIEWICZ H. 1968b: Mszyce Aphidoidea. *Katalog fauny Polski* 21 (4). State Scientific Publishers, Warszawa, 316 pp.
- TUTIN T.G., HEYWOOD V.H., BURGESS N.A., MOORE D.M., VALENTINE D.H., WALTERS S.M. & WEBB D.A. (eds) 1976: *Flora Europaea. Vol. 4*. Cambridge Univ. Press, Cambridge, 505 pp., 5 maps.
- VERESHCHAGIN B.V., ANDREEV A.V. & VERESHCHAGINA A.B. 1985: (*Aphids of Moldavia*.) Ştiinţa, Kishinev, 158 pp. (in Russian).
- WOOD-BAKER C.S. 1980: Aphids of Kent. *Trans. Kent. Field Club* **8**: 1–88.

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