

The species of *Heterarthrus* Stephens, 1835 feeding on maple (Hymenoptera, Tenthredinidae)

by E. ALTENHOFER, Groß Gerungs & L. ZOMBORI, Budapest

E. ALTENHOFER & L. ZOMBORI: The species of *Heterarthrus* Stephens, 1835 feeding on maple (Hymenoptera, Tenthredinidae). — *Annls hist.-nat. Mus. natn. hung.* 1987 79: 185–197.

Abstract — Six *Heterarthrus* species: *leucomelus* (KLUG, 1814), *aceris* (KALTENBACH, 1856), *flavicolis* (GUSSAKOVSKIJ, 1947), *imbrosensis* SCHEDL, 1981, *healyi* nom. n. (pro *Phyllotoma aceris* MCLACHLAN, 1867) and *cuneifrons* sp. n. feeding on maple (*Acer* spp.) are discussed in detail. With 18 figures.

The *aceris*-group of species in the genus *Heterarthrus* STEPHENS, 1835 has always presented problems to the specialists. This was not only due to the small number of specimens available for study but also to the inadequate knowledge, especially of the early life history of the species concerned. Thus, works going into details are always much welcome, since the solution of long-standing problems renders sound basis for further study.

The hereunder presented contribution is somewhat extraordinary, since out of the six species the type of two was unavailable, therefore, the authors had to rely wholly on the original descriptions and on the relevant literature sources. The authors did not spare time nor sinew to find the place of deposition of these two types, unfortunately, without success. Thus, the types of the species *Phyllotoma aceris* KALTENBACH, 1856 and *Phyllotoma aceris* MCLACHLAN, 1867 have not been recovered, since the museums: British Museum (Natural History), London (J. Quinlan), Commonwealth Institute of Entomology, London (I. Gauld), Museum für Naturkunde (Zoologisches Museum), Berlin (G. Königsmann), Naturhistorisches Museum, Wien (Dr. M. Fischer), The Castle Museum, Norwich (Dr. T. Erwin), to which we had sent letters of request were wholly unaware of their whereabouts. Notwithstanding, the help of the above colleagues, in trying to locate the types of these two species, is much appreciated and whole-heartedly thanked also herewith.

HISTORICAL BACKGROUND

The species of *Phyllotoma aceris* KALTENBACH was described in the Verhandlungen in 1856. The original description is not long, thus, it is difficult to readily apply the features to any species of the *aceris*-group with certainty. However, the first part of the description deals with the feeding time of the larva (July and August) and with its food-plant: "Bergahorn (*Acer pseudo-platanus*).” The subsequent reference to this species is given on page 91 in the very comprehensive work of KALTENBACH's *Pflanzen-Feinde*, published in 1872. Here the author again described his own species and added some further notes, thereby modifying his original description: "Die minierende Larve lebt im Juni und Anfangs Juli in den Blättern des weissen Ahorn (*Acer Pseudo-platanus*), seltener in denen des Feld-Ahorn (*Acer campestre*)". The bionomical notes are followed by the description of the larva and the adult. His additions and obvious corrections, we are sure, were added after having read the description of R. MCLACHLAN's *Phyllotoma aceris* sp. n. and CH. HEALY's observations on the MCLACHLAN species published in 1867. From here onwards the various authors, including KALTENBACH

and MCLACHLAN themselves, mixed up the two species. This, of course, can be explained partly by the obvious homonymy, partly by the synonymy suggested by MCLACHLAN himself, and also by the rather inadequately known species of KALTENBACH.

The species *Phyllotoma aceris* MCLACHLAN was originally described in the 4th volume of the Entomologist's in 1867 (October, p. 104). The not too detailed description of the imago is followed on the next page (p. 105) by a very important bionomic description of the larva prepared by CH. HEALY. He informs us that some eleven years before (June, 1856) one of his friends, CH. MILLER published notes on this species in the first volume of the Entomological Weekly Intelligencer (p. 110), giving details about a peculiar larva which when fully fed "constructs a circular case out of the upper cuticle". MILLER's first suggestion was that the larva must be allied to some microlepidopteran: "*Elachista (Antispila) Treitschkiella*". This observation clearly demonstrates that MILLER was quite unaware of KALTENBACH's species described in Germany in the very same year, in 1856. HEALY states that the "larvae are very conspicuous on the leaves of *Acer campestre* during the months of June and July; occasionally I have met with them on *Acer pseudo-platanus*". Still in 1867 MCLACHLAN wrote on page 123 of the Entomologist's that he found the original reference of KALTENBACH's species in the Verhandlungen, and concluded there, that his own "is undoubtedly the same species, described by Herr Kaltenbach under the same name...".

However, the problem was further aggravated by RITZEMA BOS (1892) and DALLA TORRE's Hymenoptera catalogue (1894) which did not have any reference to the original description of KALTENBACH's species and cited only the reference figured in the Pflanzen-Feinde. So at the turning of the century only *leucomelus* (KLUG, 1814) was a clear-cut species, while the value of *aceris* was rather doubtful, and peculiarly enough the specific name was assigned to MCLACHLAN; this practice was kept up in the subsequent publications too (F. KONOW: Genera Insectorum, 1905; E. ENSLIN: Die Tenthredinoidea Mitteleuropas, 1914).

While preparing his doctoral thesis the first author collected for several years larvae of leaf-mining sawflies of different genera in various localities of Austria. A part of his material forms the basis of the present contribution, though there are a few specimens which originate from other sources (France, Hungary). Consequently, our findings and conclusions principally rely, in most of the cases, on long series of reared, authentic material.

Owing to the fact that the early descriptions are rather short, in the subsequent part the species are described in detail. The most recent descriptions, those prepared by GUSSAKOVSKIJ and SCHEDL, are given in full in the original language.

DESCRIPTION OF SPECIES

Heterarthrus leucomelus (KLUG, 1814)

Tenthredo (Emphytus) leucomela KLUG: Mag. Ges. naturf. Fr. Berlin 8: 274.

F e m a l e. — Shining black and dirty white. Head black with the following parts dirty white: labrum, clypeus, malar space, a broad band half way up the inner orbit, a more or less roundish spot above the middle of the clypeus, apical three joints of the maxillary palp and all the joints of the labial palp. Surface of head covered by densely set long, silvery pubescence. Labrum in front evenly rounded, clypeus divided transversally by a furrow, its front margin truncate. Anterior tentorial pits infundibuliform, very deep and black. Interantennal area somewhat bulging with a black fleck in the middle. Superior tentorial pits also very deep. Frontal area clearly elevated, though not limited by keels. Frons divided in the middle by a longitudinal furrow-like depression running from median ocellus down to about imaginary tangential line connecting the upper margins of the antennal sockets. Postocellar area short, scarcely longer than diameter of an ocellus, delimited on either side by a deep, round pit. Head behind eyes more or less parallel, at most a little contracted. Antenna black, but apical 5-6 joints reddish below. The number of antennal joints 11-13.

Thorax black with the following parts whitish: the lateral side of pronotum, extreme hind margin of tegula. Cenchri brownish. The acrotergite of mesonotum clearly separated by a wide transverse

groove. Anterior lobes of mesoscutum weakly coriaceous, lateral ones highly polished. Mesoscutellum with some scattered punctures posteriorly, mesothoracic postscutellum polished as is metascutellum. Mesopleuron densely covered with hairs, mesosternum polished. Legs on the anterior side whitish, posteriorly black, though coxae, trochanters and femora of middle and hind legs mostly black. Wings uniformly brownish infuscate, veins and pterostigma dark brown to black. Second anal cross-vein arcuate and adjoins first discoidal cell in front of its middle.

Abdomen black, highly polished. Sternal plates with narrow whitish band at hind margin. Hypopygium depicted in Fig. 1. Sawsheath in lateral view resembling a knife-blade, in dorsal view narrow, ending in a point. The bilateral bristles somewhat bending inwards at apical part. A portion of the saw, showing the construction of the teeth, as in Fig. 9.

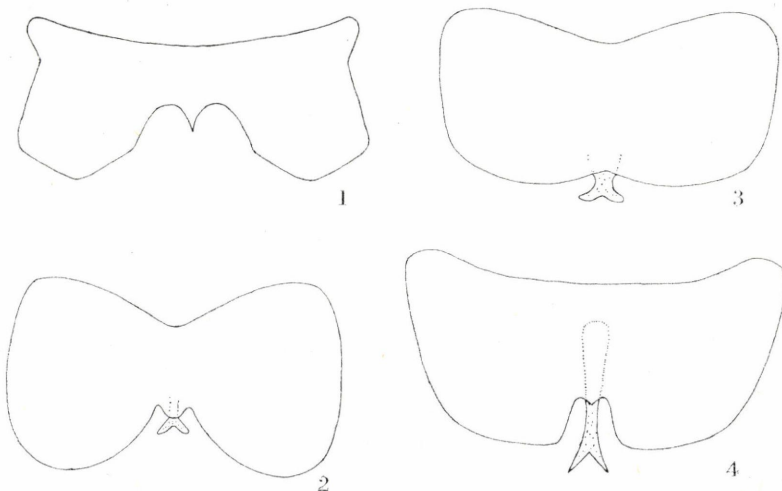
Length: 5.5–7 mm. — Alar expanse: 12–16 mm.

Male. — Black and dirty white. Head contracted behind eye, otherwise highly similar both in structure and coloration to the female. The differences are as follows. Apical joint of the labial palp black. The broad margin of the antennal sockets white. The apical margin of both scape and pedicel also white. Last 4–5 antennal joints entirely rusty brown, while joints 6–7 rusty brown only underneath. Tegulae entirely white. The lateral side of pronotum with a large white spot. Cenchri white. Legs more extensively light-coloured, thus, middle and hind femora and tibiae on the anterior side whitish. Epiproctum whitish in the middle. External parameres with broad yellow margin apically. Penis valve shown in Fig. 10.

Length: 3.5–5.5 mm. — Alar expanse: 9–11 mm.

Larva. — Yellowish white. Head light brown, though frontal suture and metavertical part yellow. Labrum evenly emarginated on front margin. Clypeus deeply, almost triangularly, excised anteriorly. Frons scutiform, divided into three distinct fields by a distally converging pair of grooves, proximally grooves pass into lateral margin of clypeus. Antenna four-jointed bearing a long white bristle apically. Pronotum with a pair of large light brown spots, the rest of thoracic and abdominal tergites yellowish white. Prosternum with a peculiar X-shaped, brown, sclerotized mark. Meso- and metasternum with a large, medial spot each. Anal ring with very regular, necklace-like sclerotization with numerous small denticles (Fig. 16). — Length: 13 mm.

The larva feeds both in the leaves of *Acer campestre* and *A. pseudoplatanus* found in open landscape, along roads and in hedges. The egg is laid in one of the apices of the leaf and the emerging larva mines towards the middle of the leaf (Fig. 13). The fully fed larva spins its cocoon inside the mine, which remains in the leaf, and in the autumn falls to the ground. In the lower regions (e.g. in the eastern part of Lower Austria and Burgenland), the cocoons are completed at about the end of July and in the beginning of August. On the other hand,



Figs 1–4. The female's hypopygium of 1 = *Heterarthrus leucomelus* (KLUG), 2 = *H. aceris* (KALTENBACH), 3 = *H. healyi* nom. n., 4 = *H. cuneifrons* sp. n.

at higher altitudes (600–700 m) the larvae were observed still feeding in the beginning of September. Among the *Heterarthrus* species associated with maple, *leucomelus* (KLUG, 1814) displays the longest feeding time (up to more than six weeks, even in lower regions). The rearings produced a total of 499 females and 847 males.

Material examined. — Austria: St. Christophen, 2. II. 1976, larva ex *A. campestre* 12. VII. 1975, leg. Altenhofer (1 specimen); Riederberg, 10. III. 1976, larva ex *A. pseudoplatanus* 19. VII. 1975, leg. Altenhofer (1 specimen); Riederberg, 24. V. 1976, larva ex *A. campestre* 8. VIII. 1975, leg. Altenhofer (1 specimen); Linz, 4. V. 1977, larva ex *A. campestre* 13. IX. 1976, leg. Altenhofer (4 specimens); Linz, 7. V. 1977, larva ex *A. campestre* 13. IX. 1976, leg. Altenhofer (31 specimens); Gr. Pertholz, 8. V. 1977, larva ex *A. pseudoplatanus* September, 1976, leg. Altenhofer (2 specimens); Linz, 13. V. 1977, larva ex *A. pseudoplatanus* August, 1976, leg. Altenhofer (48 specimens); Strasswalchen, 3. V. 1978, larva ex *A. campestre* 25. VIII. 1977, leg. Altenhofer (9 specimens). — Hungary: Bükk-h., Nagyvisnyó, Elza-lak, 1956. V. 28–VI. 4, leg. Mihályi and Zsirkó (1 specimen) — A total of 98 specimens.

***Heterarthrus aceris* (KALTENBACH, 1856)**

Phyllotoma Aceris KALTENBACH: Verh. naturh. Ver. preuß. Rheinl. 13: 257–258.

Female. — Shining black and dirty white. Head black with the following parts dirty white or yellowish brown: labrum, clypeus (though in the middle at hind margin with a brown smudge), malar space partly, a broad band along inner orbit about half way up the eye, a U-shaped fleck on inter antennal area, joints 2 and 3 of the labial palp and 3 and 4 of maxillary palp, base of mandible. Head covered by sparse, silvery pubescence. Labrum on front margin broadly rounded, clypeus divided in

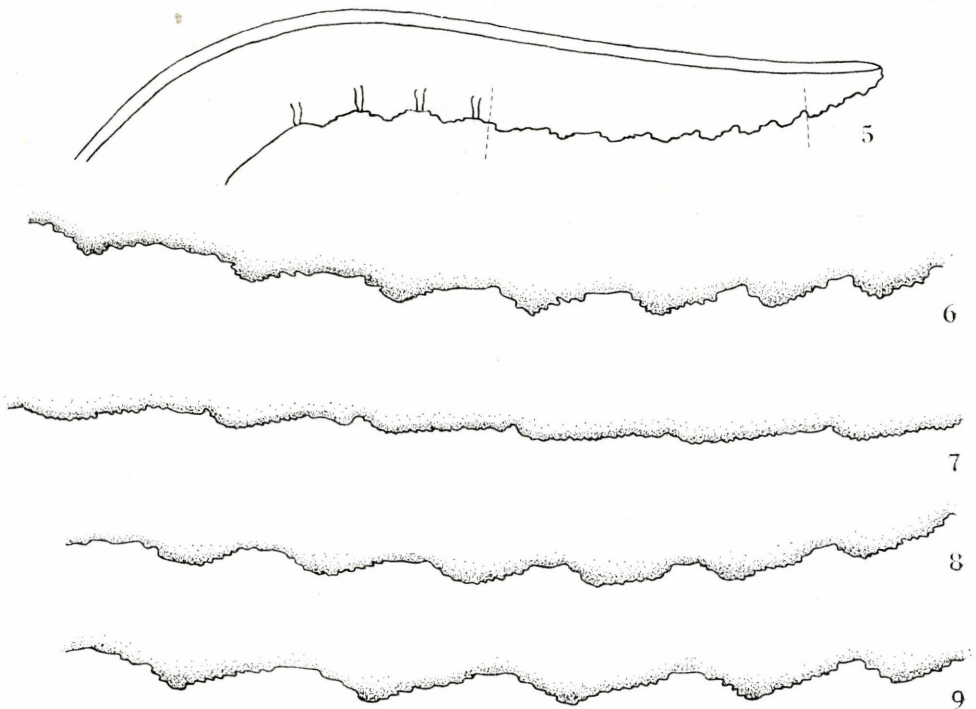


Fig. 5. *Heterarthrus aceris* (KALTENBACH), the saw of the female (the section between the broken lines indicates the enlarged portion of the saw shown in Figs 6–9). — Figs 6–9. The portion of the saw of 6 = *H. aceris* (KALTENBACH), 7 = *H. cuneifrons* sp. n., 8 = *H. healyi* nom. n., 9 = *H. leucomelus* (KLUG)

the middle by a transverse furrow, its front margin truncate. Anterior tentorial pits deepening with almost parallel sides, shallow and black. Interantennal area bulging, divided by a long black stripe that is guttiformly dilated apically. Superior tentorial pits umbilicate, sitting at the bottom of a basin-like depression. Frontal area bulging, not delimited by keels. Frons divided in the middle by a longitudinal depression that is somewhat broad just below the median ocellus becoming very narrow downwards and ending well before the imaginary line connecting the upper margins of the antennal sockets. Postocellar area short, 1.5 times as long as diameter of an ocellus, delimited on either side by a large guttiform pit, in the middle with a shallow, longitudinal furrow. Head behind eyes strongly contracted. Antenna black but two-three apical joints entirely reddish brown. The number of joints 12, in exceptional cases 11.

Thorax black with the following parts yellowish white: very narrow lateral and hind margin of pronotum, almost entire tegula (basally with a diffuse, brownish smudge). The acrotergite of mesonotum with a wide, transverse groove at its hind margin. Anterior lobes of mesoscutum coriaceous, lateral lobes also with a longitudinal coriaceous band. Mesoscutellum shining with some weak, scattered punctures all over the surface, mesothoracic postscutellum highly polished. Cenchri dirty white. Metanotum depressed, metascutellum transversally wrinkled. Mesopleuron covered with short pubescence, mesosternum bare and shining, with very weak coriaceous surface sculpture. Legs black, apices of coxae, femora, entire tibia of fore and middle legs yellowish brown, tarsi mostly infusate. Wings light brownish infusate, veins and pterostigma brown. Second anal cross-vein straight adjoining first discoidal cell somewhat behind its middle.

Abdomen black. First tergite densely punctate, other tergites shining with dense, transverse wrinkles throughout. Sternal plates entirely dark brown. Hypopygium deeply emarginated in the middle as depicted in Fig. 2. Sawsheath in lateral view resembling a knife-blade, in dorsal view narrowing to a blunt point. Bilateral bristles bent and pointing backwards. A portion of the saw showing the construction of the teeth, as shown in Figs 5-6.

Length: 3.5-4.5 mm. — Alar expanse: 9-11 mm.

No male.

Larva. — Yellowish white. Head light yellow, frontal suture dark brown. Labrum truncate in front margin. Clypeus triangularly excised anteriorly. The other cephalic features are similar to those of *leucomelus*. Pronotum yellowish white in the last instar larva, though in the younger stadia it bears two large, indistinct brown spots, other thoracic and abdominal tergites yellowish white. Prosternum similarly, though very weakly marked as in *leucomelus*. Meso- and metasternum with a more or less oval spot each. Anal ring composed of a small number of irregular, dentiform sclerotizations (Fig. 15). — Length: 9 mm.

The larva feeds only in the leaves of *Acer pseudoplatanus* found in open landscape, along roads and in hedges. The egg is laid in one of the apices of the leaf (see ALTENHOFER 1980b: 125, Abb. 2b) and the emerging larva mines towards the middle of the leaf eating out a large blotch-like part (Fig. 14). When the larva is fully fed it spins a cocoon inside the leaf, however, before constructing its case with its mandibles it perforates the upper epidermis of the leaf at regular intervals in circular fashion. Having spun the cocoon the larva lays resting. Owing to this peculiar behaviour, the perforated, circular part of the leaf begins to dry and the epidermis breaks between two perforations, eventually causing the cocoon to fall to the ground. (On one occasion the second author observed the "jumping off" of the cocoon.) The larva feeds in the leaf until the third decade of June at the lower altitudes. However, in higher regions (above 500 m) the spinning of the cocoon is completed somewhat later, sometimes in the middle of July. Occasionally mass outbreaks occur when even 10 mines may be counted in one leaf.

The species is entirely parthenogenetic. The rearings produced a total of 260 females, and no males at all.

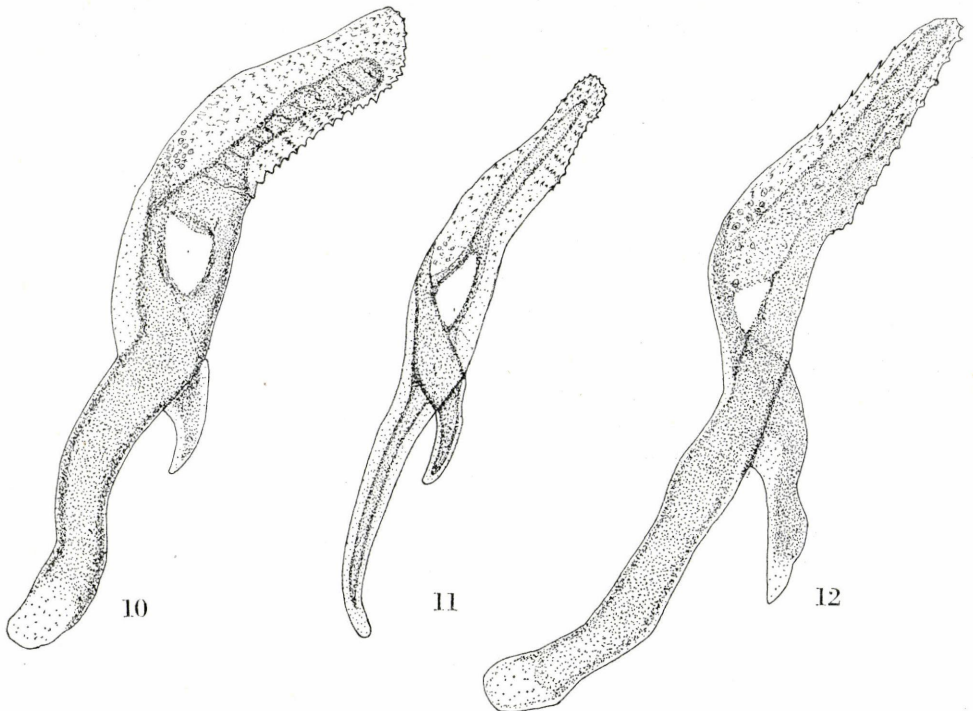
Material examined. — Austria: Köttlach, 13. III. 1977, larva ex *Acer pseudoplatanus* 10. VII. 1975, leg. Altenhofer (1 specimen); St. Pölten, 19. V. 1977, larva ex *A. pseudoplatanus* 16. VI. 1976, leg. Altenhofer (1 specimen); Kammern, 11. V. 1977, larva ex *A. pseudoplatanus* 8. VII. 1976, leg. Altenhofer (47 specimens); St. Pölten, 11. V. 1977, larva ex *A. pseudoplatanus* 16. VI. 1976, leg. Altenhofer (60 specimens); Kammern, 12. V. 1977, larva ex *A. pseudoplatanus* 8. VII. 1976, leg. Altenhofer (45 specimens); Kammern, 15. V. 1977, larva ex *A. pseudoplatanus* 8. VII. 1976, leg. Altenhofer (1 specimen). — A total of 155 specimens.

Heterarthrus flavicollis (GUSSAKOVSKIJ, 1947)

Phyllotoma flavicollis GUSSAKOVSKIJ: Soobshch. AN, Gruzinsk. 8 (3): 179-181.

♀. Nigra, mandibulis, apice excepto, partibus oralibus inferioribus, labro, clypeo, facie fere usque ad ocellum anticum genisque saturate flavis, pronoto tegulisque concoloribus, abdomine nigro, marginibus posticis segmentorum anguste (in tergitorum 3-4 basaliis epipleuris latius) decoloratis, albidis; antennis fuscis, scapo pedicelloque flavis, flagello subtus laetius fusciscenti; pedibus anticis flavis, coxis trochanteribusque albidis, basi nigro-maculatis, tibiis postice apicem versus nigricanti-lineatis, femoribus basi nigro-annulatis, tarsis nigricantibus, pedibus mediis nigris, coxis apice, articulatibusque trochanterum albidis, femoribus apice late flavis, tibiis antice flavo-lineatis; pedibus posticis nigris, coxarum apice, articulationibus trochanterum geniculisque tantum albidis; alis aequaliter, sat fortiter cinerascenti-infuscatis, venis nigrofuscis, costa apice stigmatique laete fuscenti-cinereis; capite nitido, in fronte tantum microscopice punctulato, clypeo apice recte truncato, genis articulis 2 basaliibus antennarum longioribus, fronte supra antennas linea mediana tenui, plerumque nigricanti-notata, illa inferne vix, superne ad ocellum anticum distincte dilatata, foveolam acute triangularem, oculo includentem et post hoc sulco nitido inter ocellos posticos emittentem formante, area verticina valde transversa; mesonoto et scutello laevibus et politis, valde nitidis, mesopleuris sat dense, attamen subtilissime tantum punctulatis et breviter albido-pilosulis, minus nitidis; abdomine minus nitido, tergitis sat dense transversim aciculatis, valvis terebrae aspectu a latere apice suboblique rotundatis; antennis tenuibus, 11-articulatis, articulo tertio duobus basaliibus simul sumptis duplo, articulo quarto sesqui longiore; alis anticis venae cubitalis abscissa 2^a (inter venam recurrentem 1^a et transverse-cubitalem 2^a) fere omnino oblitterata, posticis areola anali 2^a apice late aperta. L. 4 mm.

♂. Feminae in coloratione et scultura simillimus, sed pedum intermediorum femoribus etiam flavis, summa basi tantum nigris, epipleuris tergitorum 5 vel 6 basaliium manifeste albido-marginatis; structura ut in ♀, sed abdomine magis elongato et tenuis; sternito ultimo apice sat anguste rotundato, antennis nonnihil brevioribus, articulo tertio duobus precedentibus simul sumptis sesqui tantum longiore. L. 3,5 mm."



Figs 10-12. The penis valve of 10 = *Heterarthrus leucomelus* (KLUG), 11 = *H. healyi* nom. n., 12 = *H. cuneifrons* sp. n.

According to the author the new species is close to "*Ph. aceris* McLachl." and also to "*Ph. fuminennis* Cam." The species was described from Georgia (Transcaucasia). The larva feeds in *Acer platanoides*. The original description is based on 10 females and 9 males.

Material examined. — Two type specimens each with two white labels with inscription and a third red label without writing. "Тбилиси, 1946, из мин клене Т. Жижилашвили"; "*Phyllotoma flavicollis*, sp. n. ♀ (typus) Gussakovski det. 1947". — The female specimen is micro-pinned and mounted on an oblong white label. The specimen is in good condition and is deposited in the Leningrad Museum. — "Тбилиси, 1945, из мин клене Т. Жижилашвили"; "*Phyllotoma flavicollis*, sp. n. ♂ (typus) Gussakovski det. 1947". The male specimen is prepared exactly like the female. It is in good condition and is deposited also in the Zoological Institute, Academy of Sciences of the USSR, Leningrad.

Heterarthrus imbroensis SCHEDL, 1981

Heterarthrus imbroensis SCHEDL: Ber. naturw.-med. Ver. Innsbruck 68: 151.

♀ (Holotypus): Körper 4 mm lang, schwarz, am Kopf Labrum, Vorderrand des Clypeus, ein wechselnd breiter Rand der inneren Orbiten und 3. + 4. Glied des Maxillarpalpus weißlich gelb, ebenso an den Vorderbeinen die Spitzen der Femora die Vorderseiten der Tibia; am Abdomen die Sternithinterränder des 2.—5. Sternites schmal weißlich gerandet. Kopf hinter den Augen verengt, Oberkopf glänzend und zerstreut punktiert, Stirnfeld seitlich nicht begrenzt, vom vorderen Ocellus zieht eine mäßig breite, mediane Rinne zur unpunktieren, flachen Interantennalgrube. Postocellarfeld etwas breiter als ein hinterer Ocellus und ca. 3× so breit wie lang, OOL doppelt so lang wie POL. Oberkopf schütter aber lang behaart. Antennen 11-gliedrig, 3. Antennenglied um 1/4 länger als das 4.

Thorax dorsal stark glänzend, Seitenlappen und teilweise der Mittellappen locker chagriniert und locker behaart. Mesepisternum glänzend aber dichter behaart. Flügelgeäder schwarzbraun inklusive Pterostigma.

Abdomen oberseits glänzend und grob quer gerieft. Sägescheide von oben gesehen gegen distal leicht verdickt und mit nach hinten gekrümmten, langen Haaren versehen. Ovipositorlänge 2/3 der Femur III-Länge, Sägescheide schmal nach hinten oben verjüngt (Abb. 3c+d).

♂ (Paratypus): Körper 3,5 mm lang, gleicht dem Gesagten beim ♀, die Verteilung der Weißfärbung ist stärker ausgeprägt als beim ♀, besonders am Vorderkopf, wo das Weiß der inneren Orbiten breiter ist und auch die gesamten Wangen erfüllt. Weißerscheint auch eine nach oben scharf waagrecht abgesetzte Interantennalzone, in der nur die Interantennalgrube zungenförmig schwarz bleibt. Weiters sind weißlich der Clypeus und Innenteile der letzten Antennalglieder. An den Beinen sind zusätzlich die Vorderseiten der Mittelbeine aufgehellt. Die tegulae sind leuchtend weiß! Am Abdomen zeigen auch die Tergitränder 2–7 einen schmalen, weißen Saum."

According to the author the new species is close to "*H. aceris* McLachlan und *H. wüstneii* (Konow)". The species was described from Crete (Imbros) on the basis of 2 female and 3 male specimens. The collecting locality is at an altitude of about 600 m. The date of collecting is 6th of May, 1980. The larva lives in the leaf of *Acer sempervirens* (cf. SCHEDL 1981: 152, Abb. 3e). The types are deposited in the author's collection.

Heterarthrus healyi nom. n.

Phyllotoma aceris McLACHLAN, 1867 (junior homonym of *Phyllotoma aceris* KALTENBACH, 1856): Entomologist's mon. Mag. 4: 104.

Female. — Shining black and dirty white. Head black with the following parts dirty white: labrum, front margin of clypeus (up to transverse furrow), malar space, a broad band half way up the inner orbit (though somewhat constricted in the middle), a square fleck above the middle of the clypeus, two small spots above antennal sockets, apical three joints of the maxillary palp, joints of the labial palp. Surface of head covered by densely set, long, silvery pubescence. Labrum rounded on its front margin, clypeus truncate, with a transverse furrow in the middle. Anterior tentorial pits deep and black. Interantennal area somewhat bulging with a guttiform spot in the middle. Superior tentorial pits shallow sitting in the frontal suture. Frontal area bulging though not clearly separated. Frons divided in the middle by a shallow, parallel-sided, then gradually narrowing, longitudinal furrow extending from median ocellus down to about imaginary line connecting the upper margins of antennal sockets. Postocellar area about 1.5 times longer than diameter of an ocellus, delimited on either side by a deep, round pit. Head only weakly contracted behind eyes. Antenna black but apical five joints clear yellow below, the others may also be rufous. The number of joints is 11, very seldom 12.

Thorax shining black with the following parts whitish: both lateral and hind margins of pronotum, entire tegula. Cenchri dirty white. The acrotergite of mesonotum clearly separated by a wide, transverse groove. Anterior lobes of mesoscutum definitely coriaceous, lateral lobes highly polished. Mesoscutellum smooth with some scattered hairs only. Mesothoracic postscutellum polished as is metascutellum. Mesopleuron covered with short, densely set hairs, mesosternum polished. Legs on the anterior side whitish, posteriorly brownish black. Coxae of first two pairs of legs marked by a whitish spot on the anterior side. Trochanters partly yellow, apex of all femora more or less marked with white. Wings uniformly light brownish infuscate, veins dark brown, apex of costal vein and pterostigma light brown. Second anal cross-vein straight and adjoins first discoidal cell somewhat behind the middle.

Abdomen black and shining. Some of the down-turning portions of the tergal plates with very narrow dirty white line at the hind margin. Tergal plates with dense transverse striation. Hypopygium depicted in Fig. 3. Sawsheath in lateral view angulate at its apical quarter, in dorsal view bilateral bristles straight clearly pointing backwards; apex of sheath narrow, pointed. A portion of the saw, showing the construction of the teeth, as in Fig. 8.

Length: 3-4 mm. — Alar expanse: 9-11 mm.

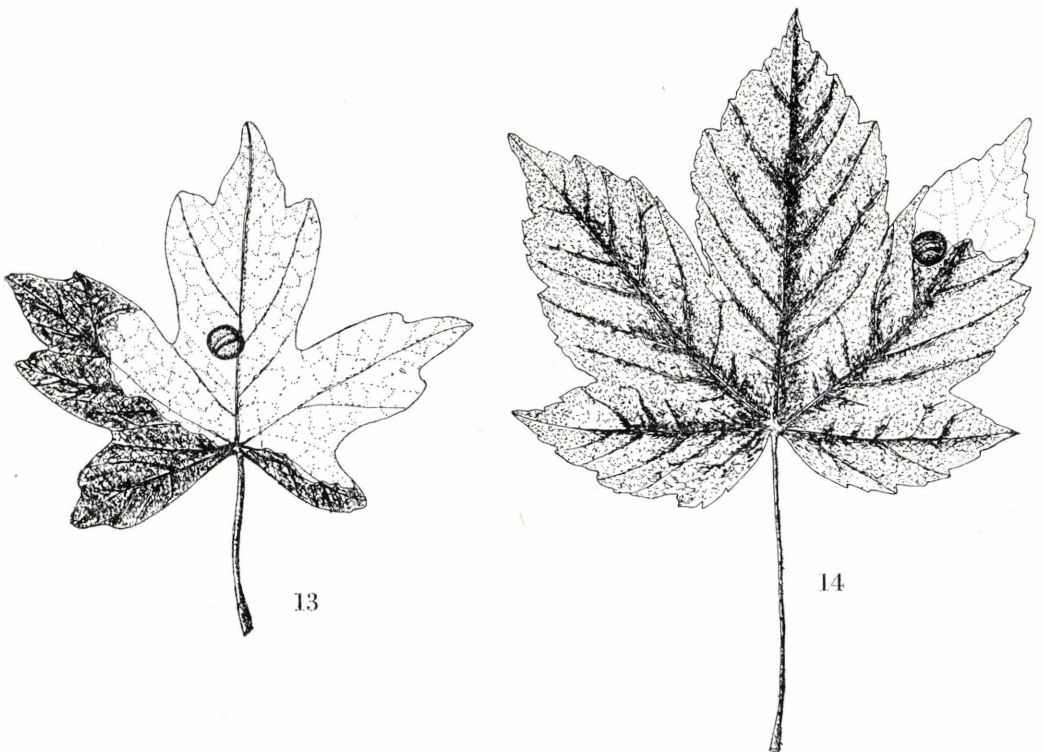


Fig. 13. The mine of *Heterarthrus leucomelus* (KLUG) larva in the leaf of *Acer campestre*. — Fig. 14. The mine of *H. aceris* (KALTENBACH) larva in the leaf of *A. pseudoplatanus*

Male. — Black and ivory-white. Head weakly contracted behind eyes. In the main characteristics it is similar to the female but the ivory-white colour is more extensive: labrum, clypeus (excepting extreme hind margin), malar space including postgenal area, palps, a large U-shaped mark on the interantennal area, inner orbit broadly. Scape and pedicel with a yellow apical ring, six apical antennal joints reddish brown below. Tegula entirely, lateral and hind margins of pronotum broadly ivory-white. Cenchri dirty yellow. Legs more extensively white, including coxae, trochanters, anterior side of fore femora, apices of other two femora. Epiproctum and cerci also white. Penis valve as shown in Fig. 11.

Length: 2.5–3.5 mm. — Alar expanse: 7–9 mm.

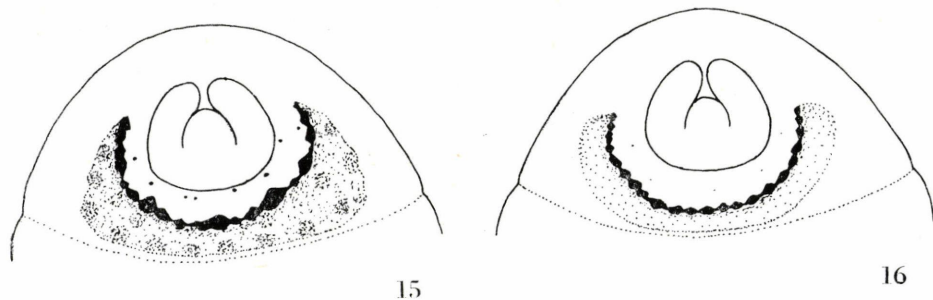
Larva. — Yellowish white and rather slender. Head brown, frontal suture dark brown. Labrum evenly emarginated on front margin, clypeus excised anteriorly, frons disciform, divided into three distinct fields, but the middle one is very narrow, distally the grooves run parallel. Antenna 4-jointed bearing a bristle apically. Pronotum with a pair of large brown blotches, mesonotum with only a pair of very small brown dots. The rest of the thoracic and abdominal tergites yellowish white. Prosternum with the peculiar X-shaped brown mark, whose upper branches are almost horizontal and confluent with the brown colour encircling the fore pair of legs. Meso- and metasternum with a large roundish spot medially. Legs also with brown flecks. Abdominal sternites each with a small medial sclerotization down to the anal ring. This latter much resembles that of *aceris* (KALTENBACH) though even less number (5–6) of dentiform sclerotizations build up the ring itself. — Length: 9 mm.

The larva feeds exclusively in the leaf of *Acer campestre* found in open landscape, along road and in hedges. The egg is laid in one of the apices of the leaf (as in *aceris*; cf. ALTENHOFER 1980b: 125, Abb. 2b) and the emerging larva mines towards the middle of the leaf (Fig. 17). The fully fed larva spins its cocoon in the mine and similarly to that of *aceris* (KALTENBACH) perforates the upper epidermis of the leaf, so eventually the cocoon falls off (see ALTENHOFER 1980b: 129, Abb. 5). The diapause begins in about the last decade of June. The rearings produced 57 females and 30 males.

Material examined. — Austria: Asten b. Linz, larva ex *Acer campestre* 6. V. 1977, leg. Altenhofer (3 specimens); Linz, larva ex *A. campestre* 11. V. 1977, leg. Altenhofer (8 specimens); Linz, 4. V. 1978, larva ex *A. campestre* 3. VI. 1977, leg. Altenhofer (20 specimens); St. Pölten, 26. IV. 1977, larva ex *A. campestre* 16. VI. 1976, leg. Altenhofer (5 specimens), also on 27. IV. 1977 (2 specimens), 28. IV. 1977 (15 specimens), 30. IV. 1977 (1 specimen). — France, Lille (Service de la Protection des Vegetaux), IV. 1960, leg. H. Chevin (ex élève) (2 specimens). — A total of 56 specimens.

Heterarthrus cuneifrons sp. n.

Female. — Shining black and dirty white. Head black with the following parts dirty white: labrum (though basally two small black dots present) anterior one-third of clypeus (up to transverse furrow), small spot on inner orbit at height of the middle of frons, apical half of the third joint of the maxillary palp, joints 4 and 5 of the same, all joints of labial palp excepting apical one. Surface of head covered with densely set silvery pubescence. Labrum on front margin broadly rounded, cly-



Figs 15–16. The anal ring of the larva of 15 = *Heterarthrus aceris* (KALTENBACH), 16 = *H. leucomelus* (KLUG)

peus divided by a transverse furrow in lower one-third, anterior margin truncate. Anterior tentorial pits large, though not conspicuously, since they are almost hidden below antennal articulation. Interantennal area almost flat, only somewhat convex, entirely black. Superior tentorial pits elongate, inconspicuously sitting in frontal suture. Frontal area weakly elevated, not delimited by keels. Frons peculiarly divided in the middle by a cuneate depression, broad just below median ocellus, downwards converging and almost meeting at mid-line of frons, from here on a bare, highly polished surface streak continues downwards appearing to be a channel of the cuneate depression. Postocellar area short, about 1.5 times the diameter of an ocellus, delimited on either side by a large, though not too deep, round pit. Head behind eyes strongly constricted. Antenna black, but apical five joints weakly reddish below. The number of joints 12, sometimes 11 (mostly in males).

Thorax black with the following parts whitish: extreme lateral corner of pronotum, distal half of tegula. Cenchri white. The acrotergite of mesonotum separated by an almost imperceptible transverse line. Anterior and lateral lobes of mesoscutum with very fine coriaceous sculpture. Mesoscutellum smooth and polished with some scattered hairs, mesothoracic postscutellum sloping behind, highly polished (paratype). Mesopleuron with silvery pubescence, mesosternum bare and shining. Legs black, but anterior sides of fore femora and of all tibiae dirty white, apices of middle and hind femora also white. Coxae and trochanters partly white. All tarsi black. Wings strongly infusate, veins and pterostigma black. Second anal cross-vein regularly arcuated and adjoins first discoidal cell in the middle.

Abdomen black, shining with some transverse corrugations. Hypopygium very characteristic as shown in Fig. 4. Sawsheath in lateral view resembles a knife-blade, somewhat broad in dorsal view, but blunt at apex. Bilateral bristles are brown, short and point outwards, rather than backwards. A portion of the saw, showing the construction of the teeth, depicted in Fig. 7.

Length: 4.5 mm. — Alar expanse: 10 mm.

Male. — Black and yellowish white. Head strongly contracted behind eyes. In the main features it is highly similar to the female, but more richly coloured with yellowish white: labrum, clypeus malar space, inner orbit (up to about two-thirds of the eye), a U-shaped mark on interantennal area

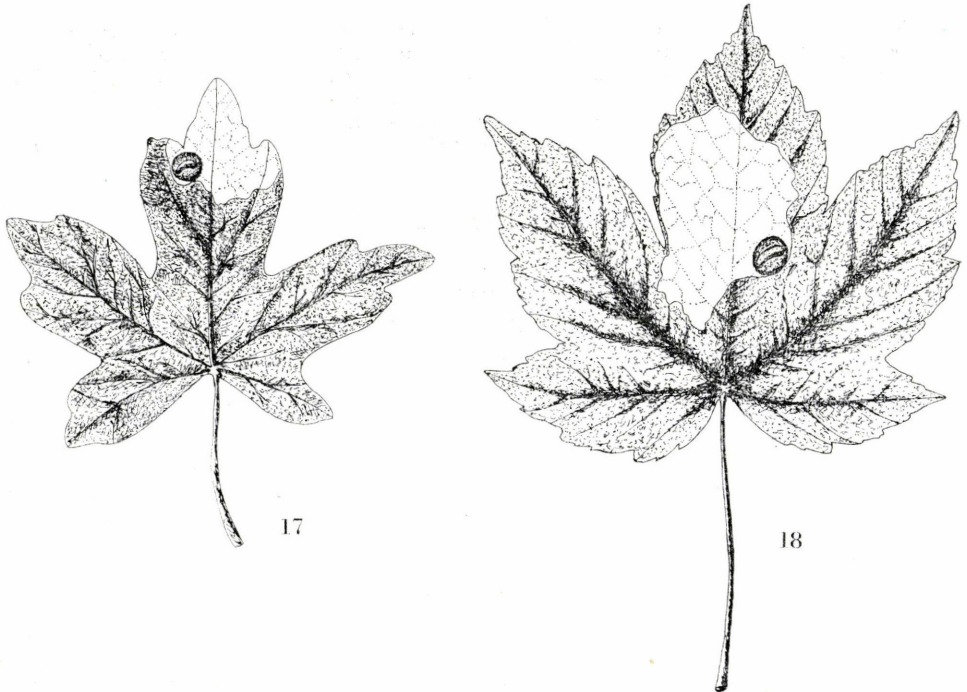


Fig. 17. The mine of *Heterarthrus healyi* nom. n. larva in the leaf of *Acer campestre*. —Fig. 18. The mine of *H. cuneifrons* sp. n. larva in the leaf of *A. pseudoplatanus*

maxillary and labial palps, though apical joint of each is dark brown. Lateral and hind margins of pronotum, tegula, fore and middle coxae and trochanters mostly, apex of hind coxae, the anterior surface of all legs (though tarsi fuscous). Cenchri brown, downturned portions of abdominal tergites marginally also marked by white. Antenna black, only apical 4–5 joints dark brown. Epiproctum whitish apically as are external parameres. Penis valve is shown in Fig. 12.

Length: 3.5–4 mm. — Alar expanse: 8–9 mm.

Larva. — Yellowish white and rather robust. Head yellow, frontal suture light brown. Labrum entire on front margin, clypeus triangularly excised anteriorly, frons scutiform, apparently entire, undivided. Antenna 4-jointed, bearing a long, white bristle apically. Pronotum with a large, though almost imperceptible, light brown fleck, mesonotum with a pair of small, similarly light-coloured specks. Metanotum and abdominal tergites yellowish white. Prosternum with a large, light brown, X-shaped mark having a broad middle part. Meso- and metasternum with a light brown, round spot each. Other ventral plates yellowish white. Anal ring shows an intermediate form between *leucomelus* and *aceris*, i.e. the brown, dentiform sclerotizations are regularly set, but are only a few (6–8) in number (cf. ALTENHOFER 1980a: 47, Abb. 9c).

Length: 10 mm.

The larva feeds exclusively in the leaf of *Acer pseudoplatanus* found in shady woods and scrub forests mixed with *Carpinus*, *Fagus* and *Ulmus* (e.g. Vienna woods, the environs of Salzburg, along the river Salzach south of the town). The eggs are laid in the middle of the leaf (see ALTENHOFER 1980b: 125, Abb. 2a), close to the apex of the leaf petiole, in the vicinity whence the main veins ramify. The emerging larva mines towards one of the apices of the leaf (Fig. 18; cf. RITZEMA BOS 1892: Taf. 1: Abb. 1). The fully fed larva spins its cocoon within the leaf and perforates the upper epidermis of the leaf causing the drying leaf to shed the cocoon, similarly to the species of *aceris* (KALTENBACH) and *healyi* nom. n. The cocoon is completed in the last decade of June or early in July. The rearings produced 7 females and 21 males.

Material examined. — **Holotype** ♀: "Heterarthrus M. *Acer pseudopl.*", "c. 1985–06–05 em. 1986 April Neulengbach, NÖ.", "Holotypus *Heterarthrus cuneifrons* sp. n. Altenhofer et Zombori 1986", "Hym. Typ. No. 2938 Mus. Budapest". — **Paratypes** 3 ♀ and 6 ♂ with the same labels as above, Nos. 2940–2948. **Paratype** ♀: "Heterarthrus sp. M *Acer pseudoplatanus*", "c. 1977 06 19 em. 1978 04 15 Laaben/Austria", "Paratypus ♀ *Heterarthrus cuneifrons* sp. n. Altenhofer et Zombori 1986", "Hym. Typ. No. 2939 Mus. Budapest". **Paratypes** 3 ♂: "Austria Innsbruck Hungerburg", "1974. VI. 2 leg. Zombori", "ex mines *Acer pseudoplatanus*", "Paratypus ♂ *Heterarthrus cuneifrons* sp. n. Altenhofer et Zombori 1986", Nos. 2949–2951. **Paratype** ♂: "Heterarthrus mid", "c. 1975 06 07 em. 1976 03 01 Salzburg", "Paratypus ♂ *Heterarthrus cuneifrons* sp. n. Altenhofer et Zombori 1986", "Hym. Typ. No. 2952 Mus. Budapest". **Paratype** ♂: "Heterarthrus mid", "c. 1975 06 07 em. 1976 02 21 Salzburg", "Paratypus ♂ *Heterarthrus cuneifrons* sp. n. Altenhofer et Zombori 1986", "Hym. Typ. No. 2953 Mus. Budapest". — A total of 16 specimens.

Remarks. — The new species comes close to *H. aceris* (KALTENBACH, 1856), especially as far as the number of the antennal joints, the head contracted behind the eyes and the host-plant (*Acer pseudoplatanus*) are concerned. However, it is a darker species since the face, and especially the malar space is entirely black (white in *aceris*), the tegula is black on its basal half (entirely white in *aceris*). The egg is laid in the middle of the leaf and the larva mines towards one of the apices of the leaf (in *aceris* the egg is laid in one of the apices of the leaf and the larva mines inwards).

KEY TO THE FEMALES OF THE *ACERIS*-GROUP

- 1 (4) Head behind eyes parallel or, at most, weakly contracted.
- 2 (3) Larger specimens: 5.5–7 mm. Tegula black. Hypopygium as shown in Fig. 1
leucomelus (KLUG, 1814)
- 3 (2) Smaller specimens: 3.5–4.5 mm. Tegula dirty white. Hypopygium as shown in Fig. 3
healyi nom. n.

- 4 (1) Head behind eyes strongly contracted.
 5 (6) Sawsheath dilated at apex
imbrosensis SCHEDL, 1981
- 6 (5) Sawsheath pointed at apex.
 7 (8) The light colour is clear yellow. Scape and pedicel yellow
flavicollis (GUSSAKOVSKIJ, 1947)
- 8 (7) The light colour is dirty white. Scape and pedicel black.
 9 (10) Malar space and basal half of tegula black. Teeth of saw small as shown in Fig. 7.
 Hypopygium as depicted in Fig. 4
cuneifrons sp. n.
- 10 (9) Malar space and entire tegula dirty white. Teeth of saw large as shown in Fig. 6.
 Hypopygium as depicted in Fig. 2
aceris (KALTENBACH, 1856)

KEY TO THE MALES OF THE *ACERIS*-GROUP

- 1 (2) Scape and pedicel entirely yellow. First flagellar joint also yellow above
flavicollis (GUSSAKOVSKIJ, 1947)
- 2 (1) Scape and pedicel black.
 3 (4) Lateral lobes of mesoscutum smooth and shining, at most very weakly coriaceous.
 Penis valve as shown in Fig. 10
leucomelus (KLUG, 1814)
- 4 (3) Lateral lobes of mesoscutum strongly coriaceous.
 5 (6) Frons with a deep, cuneiform depression. Penis valve as shown in Fig. 12
cuneifrons sp. n.
- 6 (5) Frons with a shallow, longitudinal groove.
 7 (8) Penis valve as depicted in Schedl's work (1981, Abb. 3a-b)
imbrosensis SCHEDL, 1981
- 8 (7) Penis valve as shown in Fig. 11
healyi nom. n.

Distribution. — Owing to the inadequate knowledge of the classical species and the confusion in their nomenclature, the previous distributional records should be handled with utmost care, for some might obviously be misleading.

References

- ALTENHOFER, E. (1980a): Zur Systematik und Morphologie der in Baumblättern minierende Blattwespen (Hym., Tenthredinidae). — *Z. angew. Ent.* **89** (1): 42–53.
- ALTENHOFER, E. (1980b): Zur Biologie der in Baumblättern minierenden Blattwespen (Hym., Tenthred.). — *Z. angew. Ent.* **89** (2): 122–134.
- DALLA TORRE, C. G. DE (1994): *Catalogus Hymenopterorum*. Vol. I: Tenthredinidae incl. Uroceridae. — Lipsiae, 459 pp.
- ENSLIN, E. (1914): Die Tenthredinoidea Mitteleuropas. — *Dt. ent. Z.* **3**: 203–309.
- GUSSAKOVSKIJ, V. V. — Гуссаковский, В. В. (1947): Новый вид р. *Phyllotoma* Fall. из Грузии (Hymenoptera, Tenthredinidae). — *Сообщ. АН Груз. ССР* **8** (3): 179–181.
- HEALY, Ch. (1867): Observations on the oeconomy of the saw-fly (*Phyllotoma aceris*, McLach.) that mines the leaves of maple. — *Entomologist's mon. Mag.* **4**: 105–107.
- KALTENBACH, I. H. (1856): Die deutschen Phytophagen aus der Klasse der Insekten, od. Versuch einer Zusammenstellung der auf Deutschlands Pflanze beobachteten Bewohner und deren Feinde. — *Verh. naturh. Ver. preuss. Rheinl.* **13**: 257–258.

- KALTENBACH, I. H. (1872): Die Pflanzen-Feinde aus der Classe der Insecten, I-III. — Stuttgart, 848 pp.
- KLUG, FR. (1814): Gattung: Tenthredo. — *Mag. Ges. naturf. Fr.* (Berlin) **8** (4): 273–307.
- KONOW, F. W. (1904): 29. Hymenoptera: Fam. Tenthredinidae. — *Genera Insectorum* 176 pp.
- McLACHAN, R. (1867): Additions, & c., to the British Tenthredinidae. — *Entomologist's mon. Mag.* **4**: 102–105.
- McLACHLAN, R. (1867): Additional notice respecting the maple-mining saw-fly (*Phyllotoma aceris*). — *Entomologist's mon. Mag.* **4**: 123.
- RITZEMA BOS, J. (1892): Die minierende Ahornafterraupe (*Phyllotoma Aceris* Kaltenbach), und die von ihr verursachte Beschädigung. — *Z. PflKrankh.* **2**: 9–15, 1 Tafel.
- SCHEDL, W. (1981): Die Pflanzenwespen der Insel Kreta. — *Ber. naturw.-med. Ver. Innsbruck* **68**: 145–157.

Authors' addresses: DR. EWALD ALTENHOFER
Etzen 39
A-3920 Groß Gerungs
Österreich

LAJOS ZOMBORI
Zoological Department
Hungarian Natural History Museum
Budapest, Baross utca 13
H-1088
Hungary

