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Revised occurrence of *Heterotoma* species (Heteroptera: Miridae) in the Czech Republic and Slovakia with remarks on nomenclature, diagnostic characters and ecology

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KMENT P. & BRYJA J. 2006: Revised occurrence of *Heterotoma* species (Heteroptera: Miridae) in the Czech Republic and Slovakia with remarks on nomenclature, diagnostic characters and ecology *Acta Musei Moraviae, Scientiae biologicae* (Brno) **91:** 7–52. – A revision of available material of the plant bug genus *Heterotoma* Lepeletier et Serville, 1825 from significant museum and private collections in the Czech Republic was carried out. The occurrence of *Heterotoma merioptera* (Scopoli, 1763) in the Czech Republic (both in Bohemia and Moravia) and Slovakia, and the occurrence of *H. planicornis* (Pallas, 1772) only in the Czech Republic (both Bohemia and Moravia) are documented. *Heterotoma merioptera* is also recorded from Montenegro for the first time. A history of taxonomical confusion between the species is reviewed, and neotypes are designated for both *H. merioptera* and *H. planicornis* to fix current usage for these names. The diagnostic characters, bionomy, phenology, and ecology of both species are reviewed and discussed. Lists of the most important references covering both species are added. Both *H. merioptera* and *H. planicornis* are zoophytophagous, univoltine species, overwintering in the egg stage. Adults of *H. merioptera* occur from mid-May to the end of August, those of *H. planicornis* from mid-June to the end of September (exceptionally to mid-October). Although both species are sympatric in the Czech Republic, and sometimes occur very close to one another (e.g. in the city of Brno), their co-ocurrence in the same locality was not recorded. *Heterotoma merioptera* is the more thermophilous species, preferring natural and semi-natural habitats (steppes, forest margins), while *H. planicornis* is more abundant at higher altitudes (e.g., in xerothermic patches above 400 m a.s.l., among the littoral growths around ponds and lakes); at lower altitudes it usually occurs on ruderal vegetation or in orchards.

Keywords. Heteroptera, Miridae, Czech Republic, Bohemia, Moravia, Slovakia, Montenegro, nomenclature, faunistics, ecology

Introduction

The genus *Heterotoma* Lepeletier et Serville, 1825 is a species-deficient taxon classified within the family Miridae Hahn, 1833, the subfamily Orthotylinae Van Duzee, 1916, and the tribe Orthotylini Van Duzee, 1916. The genus contains only four valid species, originally restricted to Europe and the Mediterranean area (KERZHNER & JOSIFOV 1999). Although the number of species is low, considerable confusion has surrounded their nomenclature in the past. This began with REUTER (1884), who considered the two most common European species – *Heterotoma merioptera* (Scopoli, 1763) and

H. planicornis (Pallas, 1772) to be synonymous. After many decades, both species were reconstituted as valid, but a conflict of viewpoints held by Eduard Wagner and Livio Tamanini, two well-known experts on the Miridae in the second half of the 20th century, extended the ambiguity. Despite the fact that consensus in the bases for the identity of the separate species has now been reached (cf. KERZHNER & JOSIFOV 1999), the problem of their nomenclature remains to be resolved satisfactorily. In addition, the study of a considerable body of material of both *H. meriopterum* and *H. planicornis* (mostly from the Czech Republic and Slovakia), has offered us an opportunity to improve on the morphometrical characters used for the species, as well as revealing new information on their distribution, ecology and phenology.

Material and methods

Altogether 208 specimens of *Heterotoma merioptera* and 241 specimens of *Heterotoma planicornis* were examined.

The following abbreviations are used for the collections in which the material is deposited:

BMFC . . . . . The Beskydy Museum, Frýdek-Místek, Czech Republic
JBSC . . . . . The Josef Bryja collection, Studenec, Czech Republic
JVPC . . . . . The Jitka Vilímová collection, Charles University, Prague, Czech Republic
KHMC . . . . . The Karel Hradil collection, Miletín, Czech Republic
MMBC . . . . . The Moravian Museum, Brno, Czech Republic
NMPC . . . . . The National Museum, Prague, Czech Republic
OBPC . . . . . The Ondřej Balvín collection, Prague, Czech Republic
OKKC . . . . . The Otokar Kubík collection, deposited in the Kolín Regional Museum, Czech Republic
PKPC . . . . . The Petr Kment collection, deposited in the National Museum, Prague, Czech Republic
PMSL . . . . . The Slovenian Museum of Natural History, Ljubljana, Slovenia
VMOC . . . . . Vlastivědné muzeum, Olomouc, Czech Republic
VURV . . . . . Výzkumný ústav rostlinné výroby, Praha-Ruzyně
ZJPC . . . . . The Zdeněk Jindra collection, Prague, Czech Republic
ZMAN . . . . . Zoölogisch Museum, University of Amsterdam, Amsterdam, The Netherlands

The map field codes derived from the central European mapping grid (EHRENDORFER & HAMANN 1965), as adapted by PRUNER & MÍKA (1996) and NOVÁK (1989), have been used to specify localities in the Czech Republic and Slovakia. Geographical coordinates follow ENCARTA (1998). Altitudes, where not given on locality labels, have been read from 1:50 000 maps or from the list compiled by PRUNER & MÍKA (1996).

The synonymy follows KERZHNER & JOSIFOV (1999). The nomenclature and system of plant classification is largely after KUBÁT *et al.* (2002).

Dissection of male genitalia. The apices of the abdomens of dried specimens were removed under a binocular microsope and boiled in 10% KOH for around a minute, then washed in distilled water and examined in a drop of glycerol. After examination, the genitalia were placed in PVC microvials with glycerol and pinned under the specimen.

Measurements. Apart from the two neotypes, 15 specimens of each sex and species from Bohemia, Moravia and Slovakia were measured. The images were scanned by CCD

camera from an Olympus SZX 40 microscope and measurements were taken using MicroImage 3.01 software. The data distributions were expressed as box-and-whisker plots in Statistica 6.0 (StatSoft 2001).

Nomenclature

Cimex meriopterus Scopoli, 1763 was first described from Carniolia, a historical region delimited by the connecting line Gorizia – Trieste – Kočevje – Ljubljana – 'Alpi di Wachein' [= Julian Alps] – Gorizia, now divided between Italy and Slovenia. *Cimex planicornis* Pallas, 1772 was originally described from Belgium; later PALLAS (1777) placed the position of the type locality more precisely in the Netherlands (see TAMANINI 1962, KERZHNER & JOSIFOV 1999). The genus *Heterotoma* was established to accomodate *Cimex spissicornis* Fabricius, 1777, a junior synonym of *C. planicornis* coined by LEPELETIER & SERVILLE (1825).

REUTER (1884) simply listed *Heterotoma planicornis* (Pallas, 1772) as a synonym of *H. merioptera* (Scopoli, 1763) without giving any reason. This synonymy was accepted by subsequent authors, so OSHANIN (1912) recorded three species of the genus *Heterotoma* in his catalogue – *H. meriopterum* [with synonyms *H. planicorne*, *H. spissicorne* (Fabricius, 1776), *H. atrum* (Geoffroy, 1785), ?*H. crassicorne* (Fabricius, 1794) and ?*H. crassipenne* (Turton, 1806)], *H. diversipes* Puton, 1876, and *H. acinaciforme* Costa? [sic]. Later, BERGROTH (1914) described a new related genus, *Acroderrhis* Bergroth, 1914, including a single new species – *A. dentipennis* Bergroth, 1914 – from Tunisia, and compared it with *Heterotoma*.

This situation continued until WAGNER (1950), who described another new species – *Capsus* (*Heterotoma*) *dalmatinus* Wagner, 1950 – from southern Dalmatia (Croatia), compared it with '*H. merioptera'*, figured the diagnostic characetrs of both species, and presented morphometrical characters. CARVALHO (1958) catalogued the species *H. acinaciforme*, *H. dalmatinus*, *H. diversipes* and *H. meriopterum* and compiled an extensive bibliography

TAMANINI (1962) recognized that *'H. merioptera'* in fact consists of two distinct species. Based on the examination of extensive material from 'Carniolia' and adjacent regions (Dalmatia, Istria, Friuli – Venezia Giulia), TAMANINI (1962) recognized only one species corresponding to the description of *Capsus* (*Heterotoma*) *dalmatinus*. He therefore regarded *H. dalmatina* (Wagner, 1950) to be a junior synonym of *H. merioptera* (Scopoli, 1763). For the species that WAGNER (1950) assumed to be *H. merioptera*, TAMANINI (1962) restored the name *H. planicornis* (Pallas, 1772). TAMANINI (1962) presented all the important distinguishing characters of both species (figures of antenna and male genitalia, morphometrical characters).

WAGNER (1968) synonymized the genus *Acroderrhis* with *Heterotoma*. Thus, five species of *Heterotoma* (*H. dalmatinum*, *H. meriopterum*, *H. diversipes*, *H. dentipenne* and *H. acinaciforme*) were included in his keys (WAGNER 1968, 1973). However, he considered the status of *H. acinaciforme* uncertain. WAGNER (1968) did not accept the conclusions made by TAMANINI (1962) and stated, that *H. planicornis* [= *H. merioptera*

sensu WAGNER (1950, etc.)], occurs in adjacent regions to Scopoli's terra typica for *H. merioptera*, so it is not clear which species Scopoli had at hand when describing his *H. merioptera*. Because the type material was not preserved, and the description by Scopoli is inadequate for clarity as to which species is being dealt with, WAGNER (1968) brought attention to the fact that, in such cases (according to the ICZN rules) the viewpoint of the first revising author – in this case WAGNER (1950) – is decisive. WAGNER (1968) also proposed a new name – *H. dalmatina* var. *tamaninii* WAGNER, 1968 (unavailable according to ICZN) for the form of *H. merioptera* with a narrower second antennal segment than that of the typical *H. dalmatina*.

In subsequent years, several authors (e.g., GÖLLNER-SCHEIDING 1970, 1972, 1974; HERCZEK 1979; NAU 1985) followed the authority represented by Wagner rather than the view of Tamanini. The existence of two parallel opinions prolonged the confusion in papers on species of *Heterotoma*. HERCZEK (1979), following Wagner, described a new species – *H. silesiaca* Herczek, 1979 – from southern Poland. TAMANINI (1981) synonymized *H. acinaciforme* with *H. planicornis*.

GÜNTHER & SCHUSTER (1990) accepted TAMANINI's (1962) view in their list of the Central European Heteropetra. Simultaneously, GOULA (1990) revised the genus *Heterotoma* from the Iberian Peninsula, giving a good key with figures of important characters, and morphometrical data. She followed TAMANINI (1962, 1981) for the nomenclature, but made no comment on WAGNER's (1968, 1973) viewpoint. GOULA (1990) also corrected the spelling of the species' epithets to a form corresponding with the generic name *Heterotoma*, considered as a feminine.

MELBER *et al.* (1991) proposed *H. silesiaca* as a junior synonym of *H. merioptera*, citing a correspondence of genital characters figured in the original description of *H. silesiaca* with those of *H. merioptera* in TAMANINI's (1962) paper. This synonymy was later confirmed by GORCZYCA & HERCZEK (1994).

During the 1990's, the views of TAMANINI (1962) and GOULA (1990) were generally accepted and employed in many papers (see bibliography), while the idea of *H. merioptera* sensu WAGNER (1950, 1968, 1971) was used only exceptionally (RIZZOTTI VLACH 1994, STRPIĆ 1995, ARNOLD 1999, MOREBY *et al.* 1997, MEMMOTT *et al.* 2000, COLIGNON *et al.* 2003, LODOS *et al.* 2003). In the catalogues compiled by SCHUH (1995) and KERZHNER & JOSIFOV (1999) four valid species were listed, *H. dentipennis*, *H. diversipes*, *H. merioptera* and *H. planicornis*, together with their synonyms and a review of their distribution.

It is generally believed that both holotypes of *H. merioptera* and *H. planicornis* are lost (TAMANINI 1962, WAGNER 1968, KERZHNER & JOSIFOV 1999). According to HORN *et al.* (1990), the Scopoli's collection was probably damaged by shipwreck or by fire in 1766. The Pallas's collection of insects (except Coleoptera and Diptera) found its way via J. F. Schüppel to the Zoological Museum in Berlin (HORN *et al.* 1990), but the type specimen of *H. planicornis* was not found there (J. DECKERT, pers. comm. 2003). In such an event, the statement of the first revising author (i.e., WAGNER 1950) should be followed (see ICZN 1999, Article 24.2). However, most recent authors follow TAMANINI'S (1962) view, e.g., GOULA 1990; GÜNTHER & SCHUSTER 1990, 2000; HENRY &

WHEELER 1992; SCHUH 1995; KERZHNER & JOSIFOV 1999, which appears very credible but lacks definitive proof. Because the reconstitution of the names used by WAGNER (1950, etc.) is contradictory to the stability of the nomenclature, we prefer the designation of neotypes as *H. merioptera* and *H. planicornis* to fix the present usage of the names.

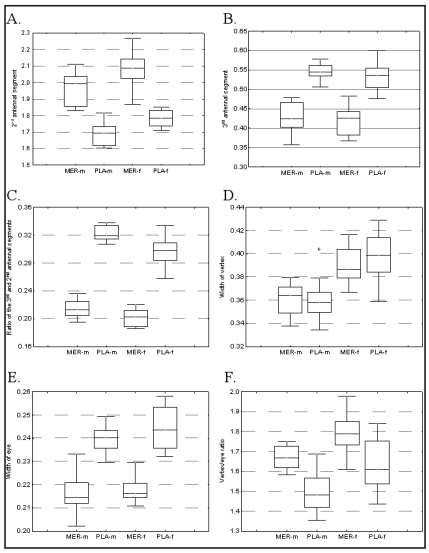
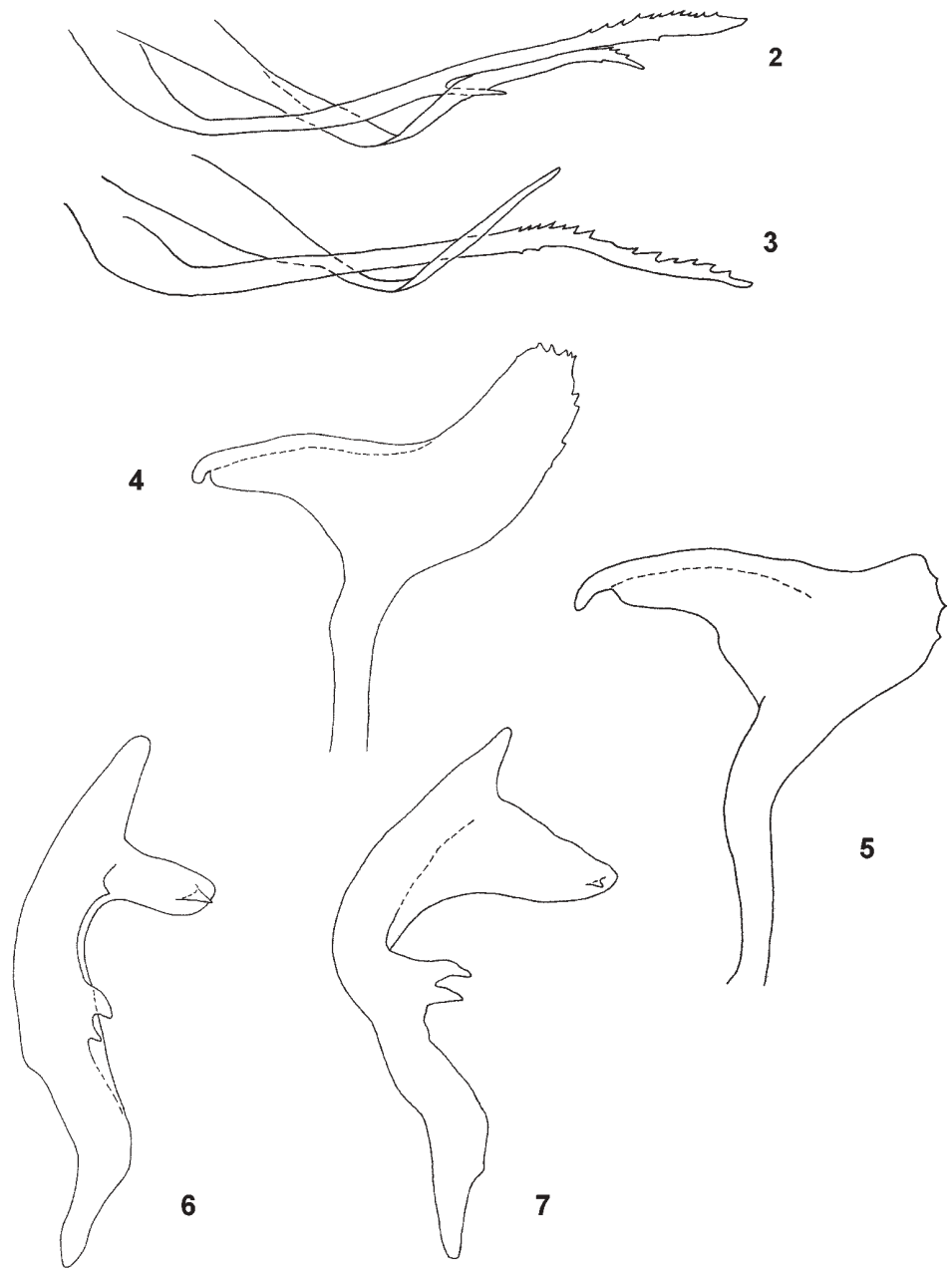


Fig. 1. Box-and-whisker plots (median, 25% and 75% quartiles, and non-outlier range are figured) for four measured characters and their ratios in males (m) and females (f) of *Heterotoma merioptera* (SCOPOLI, 1763) (MER) and *H. planicornis* (PALLAS, 1772) (PLA): A – length of antennomere 2; B – length of antennomere 3; C – ratio between antennomeres 3 and 2; D – width of vertex; E – mean width of eyes; F – ratio between width of vertex and eye.

Remarks on diagnostic characters

The most reliable distinguishing characters between *H. merioptera* and *H. planicornis* are the male genitalia (TAMANINI 1962, WAGNER 1968, GOULA 1990). However, some measurements have been used to identify each species, most often the ratio between the lengths of antennomeres 3 and 2 (WAGNER 1968, 1973; GOULA 1990). Unfortunately, antennomeres 3 and 4 are often missing in collection specimens, so it would be very useful to find other distinguishing characters. We have concentrated on the lengths of antennomeres 2 and 3 and the width of eyes and vertex (Fig. 1, Tab. 1).

The morphometrical results obtained from the Czech and Slovak material confirmed the previous opinion that the best measured character distinguishing the species is the ratio between antennomeres 3 and 2 (Fig. 1C, Tab. 1). In neither species do the lengths of antennomeres 2 and 3 overlap at all (Fig. 1A), or only minimally (Fig. 1B). Similarly, the width of the eyes is very good distinguishing feature (Fig. 1E), while the width of the vertex (Fig. 1D) and the vertex/eye ratio, i.e. ocular index (Fig. 1F) largely overlapped. Our data do not coincide exactly with previous reports. GOULA (1990) used the ocular index to distinguish species in the Iberian Peninsula, while in Central Europe the values overlap for both sexes. Instead of the ocular index, we prefer to use the width of eye, something that also differed when measured by TAMANINI (1962) and WAGNER (1950). TAMANINI (1962) has not found differences in the length of antennomere 2, but according to our data this measure can be used for safe identification, at least in Central Europe. We have found only a single female of *H. merioptera* (locality Číměř; male from the same locality was *H. merioptera* according to genitalia and measurements) with intermediate characters both in the length of the antennomere 3 and width of eyes (this specimen is not included in Fig. 1 and Tab. 1).



Figs 2–7. Male genitalia, neotypes. 2, 4, 6 – *Heterotoma merioptera* (Scopoli, 1763): 2 – spicula of the penis; 4 – right paramere; 6 – left paramere. 3, 5, 7 – *H. planicornis* (Pallas, 1772): 3 – spicula of the penis; 5 – right paramere; 7 – left paramere.

			Antennomere 2	Antennomere 3	Ratio A3/A2	Eye width	Vertex width	Ratio vertex / eye
Heterotoma meriopterum	males	Mean	1.974	0.426	0.215	0.216	0.361	1.672
		Range	1.832-2.109	0.357-0.480	0.195-0.236	0.202-0.233	0.337-0.380	1.582-1.748
	females	Mean	2.081	0.420	0.202	0.218	0.390	1.794
		Range	1.869-2.270	0.368-0.483	0.186-0.220	0.211-0.230	0.367-0.417	1.608-1.977
Heterotoma planicornis	males	Mean	1.689	0.544	0.323	0.240	0.360	1.504
		Range	1.605-1.815	0.493-0.578	0.307-0.338	0.229-0.249	0.334-0.404	1.353-1.687
	females	Mean	1.787	0.532	0.298	0.244	0.399	1.634
		Range	1.712-1.851	0.475-0.599	0.257-0.334	0.232-0.258	0.359-0.429	1.437-1.840

Tab. 1. Mean, minimal and maximal values of measured characters in *Heterotoma merioptera* (Scopoli, 1763) and *H. planicornis* (Pallas, 1772).

MEASUREMENT (mm)	***Heterotoma merioptera***	***Heterotoma planicornis***
Body lenght	**5.013**	**4.924**
Antennomere 1 lenght	**0.591**	**0.582**
Antennomere 2 lenght	**2.068**	**1.661**
Antennomere 3 lenght	**0.480**	**0.526**
Antennomere 4 lenght	**0.539**	**0.447**
Ratio of A3 / A2 lenghts	**0.232**	**0.317**
Antennomere 2 width	**0.368**	**0.327**
Vertex width	**0.369**	**0.350**
Eye width (mean)	**0.220**	**0.244**
Ocular index	**1.676**	**1.430**
Pronotum width	**1.061**	**1.074**
Pronotum length	**0.657**	**0.641**

Tab. 2. Characters measured in neotypes of *Heterotoma merioptera* (Scopoli, 1763) and *H. planicornis* (Pallas, 1772).

Review of species

Heterotoma merioptera (Scopoli, 1763)

(Figs 1–2, 4, 6, 8–10, 12; Tabs 1–3)

= *Heterotoma dalmatinum* var. *tamaninii* Wagner, 1968 (unavailable name)
= *Heterotoma silesiaca* Herczek, 1979

Material examined. Neotype: Male, glued on piece of card. Antennomeres 3 and 4 of left antenna missing, apex of membrana damaged. Apex of abdomen with genitalia in glycerol placed in PVC microvial pinned under specimen. Labels: 'Podpeč / 6.VIII.1983 / leg.A.Gogala // ♂ // NEOTYPUS / *HETEROTOMA* / *MERIOPTERA* / (Scopoli, 1763) / des. P. Kment & J. Bryja 2004'. Terra typica: Slovenia. Additional information on locality: Ljubljana, Ljubljansko barje, Podpeč (45°58'N 14°26'E) (A. GOGALA, pers. comm.). Deposited in PMSL. Here designated.

Male genitalia of the neotype are figured (Fig. 2 – spicula of the penis, Fig. 4 – right paramere, Fig. 6 – left paramere); for measurements see Table 2. The habitus of the species is already sufficiently described e.g. by WAGNER (1950, 1968, 1971, as *H. dalmatina*), TAMANINI (1962), HERCZEK (1979, as *H. silesiaca*), and GOULA (1990).

Additional material: Czech Republic, Bohemia. 5852 – Podmoráň near Úholičky, 171–250 m a.s.l., vii.1951, 1 ♂, Macek lgt., P. Kment det. (NMPC); Unětice, 252 m a.s.l., viii.1949, 1 ♂, Macek lgt., P. Kment det. (NMPC). **5949** – N. Hütt, Wuznice (= Nižbor, Vůznice), 220–400 m a.s.l., 10.viii.(without year), 1 ♂, without collector, P. Kment det. (NMPC). **5952** – Praha, 200–330 m a.s.l., *'Prunus avia'*, 29.vi.1889, 3 ♂♂ 3 ♀♀, without collector, P. Kment det. (NMPC). Praha – Klukovice, 280 m a.s.l., 28.vii.1939, 1 ♀, without collector, P. Kment det. (NMPC). **6049** – N. Hütt (= Nová Huť), 250 m a.s.l., without date, 1 ♂ 6 ♀♀, without collector, P. Kment det. (NMPC); ditto, without date, 15 ♂♂ 31 ♀♀, Nickerl lgt., P. Kment det. (NMPC). **6051** – Řevnice, 218 m a.s.l., vii.–viii.1951, 1 ♀, J. Obenberger lgt., P. Kment det. (NMPC). **6052** – Zawist (= Praha – Zbraslav, Závist), 200–350 m a.s.l., without date, 1 ♀, without collector [Nickerl lgt.], P. Kment det. (NMPC).

Czech Republic, Moravia. 6664 – Rohozec, steppe and forest margin, 430–440 m a.s.l., 8.viii.1978, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **6666** – Ostrov u Macochy, Balcarka Cave env., 460–500 m a.s.l., 24.vii.1964, 1 ♀, I. Tešová lgt., P. Kment det. (MMBC). **6668** – Pustiměř, vineyards W of the village, 350 m a.s.l., 22.vii.1966, 3 ♂♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **67–6861–62** – Číměř, Křemetí, 400–450 m a.s.l., 28.vii.1969, 1 ♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6765** – Brno – Bys[trc], 215 m a.s.l., 1943, 1 ♀, Šnoflák lgt., P. Kment det. (MMBC); Brno – Bystrc, Kníničská přehrada Dam env., mouth of Kočičí žleb Valley, small steppe, 250–280 m a.s.l., 8.viii.1957, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC); Brno – Řečkovice, 305 m a.s.l., 28.vii.1957, 1 ♂ 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC). **6766** – Brno – Hády, 350–424 m a.s.l., without date, 2 ♀♀; ditto, 14.vii.1946, 2 ♂♂ 2 ♀♀, both J. L. Stehlík lgt., P. Kment det. (MMBC). **6863** – Ketkovice, quarry in the wood south of the village, forest steppe, 350 m a.s.l., 25.viii.1964, 2 ♀♀, P. Lauterer lgt.; ditto, Ketkovický mlýn Mill env., small steppe and clearing, 268 m a.s.l., 3.viii.1976, 1 ♀, J. L. Stehlík lgt., both P. Kment det. (MMBC); Mohelno, 345 m a.s.l., without date, 1 ♀, J. L. Stehlík lgt.; ditto, 19.viii.1965, 1 ♀, L. Pospíšilová lgt.; ditto, valley of Jihlava river between Mohelno and Kramolín villages, 300–400 m a.s.l., 7.viii.1946, 2 ♀♀, J. L. Stehlík lgt., all P. Kment det. (MMBC). **6867** – Letonice, Hájek, xerothermic wood, 380 m a.s.l., 22.vii.1971, 4 ♀♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6868** – Malínky, 'U Marků' (towards Kožušice), fallow ground, wood margins and undergrowth, 270–300 m a.s.l., 21.vii.1976, 5 ♂♂ 3 ♀♀, P. Lauterer lgt., P. Kment det. (MMBC); Strážovice, 'Babylon', secondary steppe, hedgerows and derelict gardens, 350–410 m a.s.l., 26.vii.1968, 1 ♂ 1 ♀; ditto, floriferous steppe on slope, 350–400 m a.s.l., 6.viii.1979, 1 ♀, both J. L. Stehlík lgt., P. Kment det. (MMBC). **6869** – Stupava (towards Staré Hutě), environs of a brook, beech forest and its margins, 370–410 m a.s.l., 16.viii.1984, 2 ♂♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **6870** – Salaš, 0–1 km NW of the village, brook banks, small wet meadow, shrubs and wood margin, 275–300 m a.s.l., 11.viii.1980, 1 ♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6964** – Dolní Kounice, rocks above eastern bank of Jihlava river, 220–250 m a.s.l., 21.vii.1966, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **6965** – Židlochovice, chateau park, 180 m a.s.l., 2.viii.1968, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **6967** – Kobeřice, valley 0.8–1 km eastern of Horáček gamekeeper's lodge, surroundings of pond, wood margins and mesic meadow, 240–270 m a.s.l., 25.viii.1980, 2 ♂♂, P. Lauterer lgt., P. Kment det.

(MMBC); Lovčičky, 'Na Skalách', 250–320 m a.s.l., 25.viii.1980, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC); Žarošice, 212 m a.s.l., 8.viii.1962, 1 ♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6967–68** – Archlebov, 227 m a.s.l., meadows, wood margin and undergrowth, 4.viii.1970, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6970** – Uherské Hradiště env., 179 m a.s.l., vii.1939, 1 ♀, A. Hoffer lgt., P. Kment det. (NMPC). **7062** – Hluboké Mašůvky, údolí Plenkovického potoka (towards Plenkovice village), E of Plenkovický mlýn mill, forest undergrowth, meadows and xerothermic slopes, 285–310 m a.s.l., 15.viii.1984, 1 ♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC); Němčičky, steppe and sunlit margins of wood on acid ground, 310–330 m a.s.l., 14.viii.1975, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **7065** – Strachotín, environs of the pond, wet meadows, pond shores and wood margin, 168 m a.s.l., 10.vii.1973, 3 ♂♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC); Vranovice, Vranovický les Wood, margin of floodplain forest, 175 m a.s.l., 14.viii.1974, 1 ♂ 2 ♀♀, P. Lauterer lgt., P. Kment det. (MMBC). **7066** – Kurdějov, Kamenný vrch hill, secondary and primary steppe, 250–340 m a.s.l., 26.vii.1979, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **7067** – Kobylí, Lecany Wood, steppe, wood margins and undergrowth, 200–300 m a.s.l., 17.vii.1968, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC). **70–7168** – Mutěnice, loess steppe by spot height 226.6 m a.s.l., 220–226 m a.s.l., 26.vii.1968, 1 ♂ 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC). **7069–70** – Moravský Písek, Kladíkov Wood, aeolian sands, 190 m a.s.l., 11.viii.1977, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **7070** – Uherský Ostroh, 178 m a.s.l., 25.viii.1941, 2 ♀♀, A. Hoffer lgt., P. Kment det. (NMPC). **7162** – Tvořihráz, valley of Unanovka river, floodplain forest, xerothermophilous *Querceto-Carpinetum* with clearings and ruderal elements, 260–270 m a.s.l., 20.viii.1984, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **7165** – Mušov, small steppe on small hill W of the village, 175 m a.s.l., 17.vii.1973, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC); Pavlov, Pavlovské kopce hills, 300–548 m a.s.l., 21.vii.1947, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **7166** – Bulhary, wood margin, 180–210 m a.s.l., 29.vi.1964, 1 ♂, L. Pospíšilová lgt., P. Kment det. (MMBC); Nejdek, floodplain forest and meadow, 162 m a.s.l., 20.vii.1977, 1 ♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC); Přítluky, Přítlucká hora hill, secondary steppe, shrubs and ruderal biotopes, 200–292 m a.s.l., 16.vii.1968, 1 ♂ 1 ♀, J. L. Stehlík & L. Pospíšilová lgt., P. Kment det. (MMBC); Šakvice, floodplain forest margin by Dyje river, ca 173 m a.s.l., 2.viii.1973, 1 ♀, L. Pospíšilová lgt.; ditto, SE of the village, steppe vegetation on hedges and ruderal vegetation, 170–180 m a.s.l., 22.vii.1974, 1 ♂, J. L. Stehlík lgt., both P. Kment det. (MMBC). **7169** – Radějov, Žerotín NM, 300–320 m a.s.l., 11.vii.1998, 2 ♂♂ 1 ♀, P. Kment lgt., J. Bryja det. (JBSC, PKPC). **7171** – Velká nad Veličkou, Zahrady pod Hájem NNR, 330–450 m a.s.l., 13.vii.1998, 1 ♀, M. Horsák & J. Nerudová lgt., J. Bryja det. (JBSC). **7266** – Sedlec, Vlčí lesík Wood, steppe and wood undergrowth on loess, 230–300 m a.s.l., 14.vii.1976, 5 ♂♂ 4 ♀♀, P. Lauterer lgt., P. Kment det. (MMBC); Valtice, Boří les Wood, Randezvous NNM, steppe vegetation on sands, wood undergrowth and drained pond, 200 m a.s.l., 30.v.1977, 2 ♂♂ 3 ♀♀, J. L. Stehlík lgt., P. Kment det. (MMBC); ditto, environs of Tři Grácie monument, surroundings of brooklet, wood margin and vegetation on sands, 170–180 m a.s.l., 25.vii.1968, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC). **7267** – Charvátská Nová Ves, *Quercetum* near railway to Lednice, wood margin and remains of sandy biotops, 170 m a.s.l., 31.vii.1974, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC).

Slovakia. 6778 – Rudinka, Rohovica Hill, southern and southwestern slopes of limestone hill, 7.viii.1969, 1 ♂, L. Pospíšilová lgt., P. Kment det. (MMBC). **6797** – Medzilaborce, 7.viii.1960, 1 ♂, V. Krejčí lgt., P. Kment det. (MMBC). **6876** – Nimnica, grassy slope southeast of village with small brooklet (surrounded by hygrophilous vegetation), 16.vi.1965, 1 ♂, L. Pospíšilová lgt., P. Kment det. (MMBC). **68–6992** – Sabinov, 7.vii.1960, 1 ♂, V. Krejčí lgt., P. Kment det. (MMBC). **7174** – Trenčín, ruderal vegetation, shrubs and steppe on S and E slopes under the castle, 30.vi.1968, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC). **7193** – Ličartovce, 22.vii.1961, 1 ♀, I. Tešová lgt., P. Kment det. (MMBC). **7370** – Hľboké, environs of Horný Šranek gamekeeper's lodge, wood undergrowth and wet mowed meadows, 3.vii.1968, 1 specimen (apex of the abdomen lost), P. Lauterer lgt., P. Kment det. (MMBC). **7376** – Oslany – Veľké Krsteňany, Veľký vrch Hill, steppe, 10.vii.1977, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC). **7470** – Cerová – Lieskové, between Rudava and Pustý Mlýn gamekeeper's lodges, forest undergrowth, swampy and dry meadows, 3.vii.1968, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC). **7473** – Radošina, 8 km SE Piešťany, 22.vii.1968, 1 ♂ 2 ♀♀, Ent. Exc. Zool. Mus. lgt., ? det. as *H. planicornis*, P. Kment revid. (ZMAN). **7488** – Plešivec, S and SW slopes of Plešivecká planina plateau, forest steppe with shrubs, 250–500 m a.s.l., 9.vii.1979, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC); Silica, Silická planina plateau, 26.vii.1961, 1 ♂, I. Tešová lgt., P. Kment det. (MMBC). **7568** – Malacky, Štvrtý rybník Pond, wet forest undergrowth, surroundings of the pond, ruderal along a road and undergrowth of pine forest on sands, 1.vii.1968, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **7588** – Kečovo, Čertova diera Hill, on limestone, 350–450 m a.s.l., 6.vii.1976, 1 ♀; ditto, Domica Cave env., on

limestone, 350–450 m a.s.l., 7.vii.1979, 1 ♂, both P. Lauterer lgt., P. Kment det. (MMBC). **7674** – Nitra, Zobor Hill, 18.vii.1951, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **7675** – Koliňany, 8 km NE Nitra, 20.vii.1968, Ent. Exc. Zool. Mus. lgt., ? det. as *H. planicornis*, P. Kment revid. (ZMAN). **7687** – Bátka u Rimavské Soboty, 6 km W of the village, margin of *Quercetum*, 28.vii.1962, 2 ♂♂, P. Lauterer lgt., P. Kment det. (MMBC). **8171** – Gabčíkovo, 27.vii.1955, 1 ♂, Exc. Mus. Nat. lgt., P. Kment det. (NMPC).

Hungary. Bugac (46°41'N 19°41'E), Bugac puszta, steppe on sands, grazed meadow, various trees and shrubs, 160 m a.s.l., 13.vii.1987, 2 ♂♂, P. Lauterer lgt., P. Kment det. (MMBC).

Slovenia. Ljubljana, Ljubljansko barje, Podpeč (45°58'N 14°26'E), 6.viii.1983, 1 ♂, A. Gogala lgt., P. Kment det. (PMSL). Logatec, Planinsko polje, Grčarevec (45°52'N 14°13'E), 22.vii.1987, 1 ♂, A. Gogala lgt., P. Kment det. (PMSL).

Croatia. Rovinj env. (45°05'N 13°38'E), 4 ♀♀, 1.vii.1994, Z. Jindra lgt., P. Kment det. (ZJPC); Lokrum near Dubrovnik (42°37'N 18°07'E), limestone hill, steppe, 4.vi.1967, 4 ♂♂ 2 ♀♀, P. Lauterer lgt., P. Kment det. (MMBC); Split env. (43°30'N 16°26'E), 5.vi.1959, 1 ♂, Novak lgt., P. Kment det. (NMPC).

Montenegro. Budva (42°17'N 18°49'E), Jaz Bay (6 km NW of the village), maquis and ruderal growth with halophilous plants, 5.vi.1967, 2 ♂♂, P. Lauterer lgt., P. Kment det. (MMBC).

Bulgaria. Primorsko env., mouth of Ropotamo river (42°20'N 27°46'E), Arkutino beach env., woods at river mouth and steppe on sandy dunes, 1–10 m a.s.l., 12.vii.1973, 4 ♂♂, P. Lauterer lgt., P. Kment det. (MMBC); Harmanli (41°55'N 25°53'E), left bank of Marica river, steppe, 80–102 m a.s.l., 20.vii.1971, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC); Sandanski (towards Lilyanovo) (41°36'N 23°19'E), valley of Sandanska Bystrica river, NW slopes, dry steppes with planted *Pinus* sp., 250–500 m a.s.l., 11.–14.vii.1971, 2 ♂♂, P. Lauterer lgt., P. Kment det. (MMBC); Stara Planina (43°15'N 25°00'E), 19.vii. (without year), 1 ♀, L. Hoberlandt lgt., P. Kment det. (NMPC).

Romania. Tulcea province, Babadag (44°54'N 28°44'E), 9.vii.1972, 1 ♂, L. Pospíšilová lgt., P. Kment det. (MMBC).

Distribution in the Czech Republic (Fig. 8) **and Slovakia** (Fig. 9)**.** *Heterotoma* species have been recorded in the Czech Republic by several authors. HOBERLANDT (1977) listed only *H. meriopterum* from Bohemia, Moravia, and Slovakia. Except in the most recent papers (KINKOROVÁ & KOCOUREK 2000; BRYJA *et al.* 2002; BRYJA & KMENT 2006, *in press*), all previous records may refer to either *H. merioptera* or *H. planicornis*.

The following records belong with certainty to *H. merioptera*: **Czech Republic, Bohemia:** Neuhütten, Wuznice [= Nová Huť, Vůznice] (5949), Prag, Zawist, Břežaner Tale [= Praha – Závist, Břežanské údolí Valley] (6052) (NICKERL 1905, voucher specimens in NMPC, revised). **Czech Republic, Moravia:** Brno – Bystrc (6765) (STEHLÍK 1945, voucher specimen in MMBC, revised); Uherské Hradiště (6970), Uherský Ostroh (7070) (HOBERLANDT 1947, voucher specimens in NMPC, revised); Rokytná (6963) (BRYJA *et al.* 2002); and Mikulov, Svatý kopeček NR (7165) (BRYJA & KMENT 2006).

Unrevised records published as *Heterotoma merioptera*: **Czech Republic, Bohemia:** Egerthal [= Cheb, valley of the Ohře river] (5940) (DALLA-TORRE 1878; DUDA 1884, 1886); Prag [= Praha] (?5952), Neuhütten [= Nová Huť u Nižbora] (5949), Eger [= Cheb] (5940) (SCHOLZ 1931; based on previous authors, Nickerl's records from Prague and Neuhütten actually belong to *H. merioptera*); Praha (5952), Valeč (5845), Skytaly (5845), Nová Ves u Valče (5745), Stará Oleška (5251–52), Střekov (5350) (in gardens, on *Prunus*, *Mespilus*, *Crataegus*, *Armeniaca vulgaris*, *Persica vulgaris*) (ROUBAL 1957, as *Capsus meriopterus*); Praha – Baterie (5952) (ruderal vegetation, on *Polygonum aviculare*) (ROUBAL 1959, as *Capsus meriopterus*; ROUBAL 1961); Praha – Botanical Garden of the Charles University ('Na Slupi') (5952), Praha – Motol (5951–52), Praha – Střešovice (5952) (on *Juniperus communis*) (ROUBAL 1963); Jablonecko (= wide

environs of Jablonec nad Nisou, 5256–57), Doksy (5453–54) (on *Prunus*, *Salix*, *Populus*, *Quercus*) (ROUBAL 1967); Praha – Botanical Garden of Charles University and Riegerovy sady Park (5952) (on *Quercus pubescens*, *Populus alba*, *Corylus colurna*) (KINKOROVÁ & ŠTYS 1989). **Czech Republic, Moravia:** Brno (ruderal, no exact locality) (RAUS 1989). **Slovakia:** BRANCSIK (1880) listed *H. merioptera* from Trencsén – Isztebnik (= Trenčín – Istebník) (7174) on *Acer campestre*. HORVÁTH (1897) wrote: 'In omnibus regionibus passim obvia, sed minus frequens.' (= 'In all regions widely distributed, but less frequent'). Also BALTHASAR (1937) gave no exact locality, citing only 'quite common on broadleaf trees and lower vegetation'. Later records are: Jurský šúr (7769) (ORSZÁGH 1966); Úbrež (7299) (ŠTEPANOVIČOVÁ 1967); Podunajské Biskupice (7868) (in plant association *Crataegetum danubiale*) (ŠTEPANOVIČOVÁ & LAPKOVÁ 1984, ŠTEPANOVIČOVÁ 1991).

In the territories of the Czech Republic and Slovakia, *Heterotoma merioptera* appears to prefer xerothermic localities. Most of the Moravian records come from the southern Panonnian lowlands, from which the species penetrates to moderately warm regions, often to river valleys with xerothermic vegetation on the slopes (especially apparent in the Jihlava and Rokytná river valleys). In Bohemia, it is known only from very warm localities in the valleys of the Vltava river (environs of Prague) and the Berounka river (environs of Nižbor). Although *H. merioptera* and *H. planicornis* are widely sympatric in the Czech Republic and they have been found very close to one another (e.g. in the city of Brno), they have never been found in the same locality.

General distribution. According to KERZHNER & JOSIFOV (1999), *H. merioptera* occurs in Albania, Austria, Bosnia Herzegovina, Bulgaria, Croatia, Greece, Hungary, Italy, Macedonia, Poland, Romania, Slovenia, Yugoslavia, the Asian part of Turkey, Iraq, and Israel. Its occurrence in former Yugoslavia must be viewed in the light of PROTIĆ (1998), who listed only one locality in Serbia. CARAPEZZA (2002) added a record from Jordan. In this paper we confirm the occurrence of *H. merioptera* in the Czech Republic and Slovakia, and present a new record from Montenegro. The record from Belgium by COLIGNON *et al.* (2003) may well concern *H. planicornis*.

Biology and phenology. There is no exact information about the larval development or animal prey of *H. merioptera*. However, it may be assumed that, like *H. planicornis*, it is a zoophytophagous species. Its life cycle is also very similar to that of *H. planicornis*. It overwinters in the egg stage and has one generation per year. In the Czech Republic and Slovakia, adults start to appear in the second decade of June, reach the highest abundance in the third decade of July, and than progressively disappear up to the end of August. Published phenological data (NICKERL 1905, WAGNER 1950, NOVAK & WAGNER 1951, SCHNEIDER 1976, RABITSCH 1999, MELBER *et al.* 1991, LODOS *et al.* 2003) quite agree with our records. The earlist Moravian record is from 31st May, but in this case we are not sure if the date on locality label is correct. However, it appears earlier in Dalmatia (19th May – NOVAK & WAGNER 1951) and in southern Turkey (21st May – LODOS *et al.* 2003). The latest Moravian records cite 25th August, while the latest published record from Austria cites 24th August (MELBER *et al.* 1991); however, it may well survive through to the beginning of September. In June and July, males predominated slightly in

the material collected, while in August females were more numerous (Fig. 10). Compared with *H. planicornis* (Fig. 11), *H. merioptera* starts to occur earlier and also disappears earlier, which accords with what is known of the life-span of the species (from mid-May to the end of August).

Ecology. In the Czech Republic and Slovakia, the species was found in various steppe habitats, primary as well as secondary steppes, forest steppes, the margins and undergrowth of various forests (floodplain forests, xerothermic oak and oak-hornbeam forests, beech forests), forest clearings, dry as well as floodplain meadows, hedgerows, shrubs, vineyards, parks, and derelict gardens. Records from wet habitats (brook banks, surroundings of ponds, wet and swampy meadows) are much rarer than those from xerothermic areas. Records from ruderal habitats are also rare and not very precise. In terms of geological substrates, it has been found on acid ground, limestone and loess as well as sandy biotopes, including aeolian sands. The preference of *H. merioptera* for xerothermic localities in the Czech Republic corresponds with its vertical distribution. Most of the localities recorded are situated between 150 and 350 m a.s.l. (see Fig. 12). The highest record comes from the Pavlovské kopce Hills in southern Moravia (548 m a.s.l.); however, these hills are very warm, consist of limestone and are covered with rocky steppe vegetation.

Our Bulgarian records come from various steppe habitats, inluding sand dunes on the Black Sea coast in the delta of the Ropotamo river. In Montenegro, P. Lauterer (pers. comm.) described the locality of *H. merioptera* as maquis and ruderal growth with halophilous plants. In contrast to records for *H. planicornis*, there exist only very few published accounts of the ecology of *H. merioptera*. HEISS (1996) mentioned it from shrubs and broadleaf trees in Italy; HERCZEK (1979) from undergrowth in pine forest (association *Vaccinio myrtilli-Pinetum*) in Poland. BARIĆ & CIGLAR (2002) collected it in Croatia in apple and pear orchards. PROTIĆ (2003) classified *H. merioptera* in Serbia in the submediterranean-Balkan biome, mostly deciduous dry forests. LINNAVUORI (1992) collected it in Iraq on deciduous trees in a mountain forest.

Heterotoma merioptera has been mentioned in association with 19 different plant taxa belonging to 12 families (Tab. 3). Most of these plants are shrubs and trees. There is no record of larval development on these plants.

A selected bibliography of *Heterotoma merioptera*.

The taxonomical confusions surrounding *Heterotoma* species complicate the interpretation of previously published information on their faunistics, biology and ecology. Because some of the inaccuracies still survive in important sources (incl. SCHUH 1995, WHEELER & HENRY 1992), the following list of references for particular species was compiled. Some of the localities recorded by SIENKIEWICZ (1964) for *H. merioptera* certainly apply to *H. planicornis* or *H. diversipes*.

The following abbreviations are used in the list: bion. – bionomy (incl. dates of finding), cat. – catalogue, descr. – description, distr. – distribution, ecol. – ecology (incl. 'host' plant records), ethol. – ethology, faun. – faunistics, fig. – figures, morphol. – morphology, nom. – nomenclature, redescr. – redescription, tax. – taxonomy, zoogeo. – zoogeography).

Scopoli (1763): *Cimex meriopterus* sp.nov. (descr., ecol., Italy/Slovenia).
Reuter (1884): *Heterotoma meriopterum* (partim) (tax., *H. planicornis* synonymized with *H. meriopterum*; redescr., fig., bion., distr.).
Puton (1899): *Heterotoma merioptera* (partim) (cat.).
Nickerl (1905): *Heterotoma meriopterum* (bion., ecol., faun., Czech Republic).
Oshanin (1912): *Heterotoma meriopterum* (partim) (cat., distr.).
Royer (1924): *Heterotoma meriopterum* (faun., Greece) (unrevised!).
Wagner (1950): *Capsus* (*Heterotoma*) *dalmatinus* sp.nov. (tax., descr., genitalia, fig., faun. Croatia) [syn. Tamanini (1962)].
Novak & Wagner (1951): *Heterotoma* (*Capsus*) *dalmatina* (faun., Croatia).
Wagner (1952): *Heterotoma dalmatina* (key, fig.).
Seidenstücker (1957): *Heterotoma dalmatina* (faun., Turkey).
Carvalho (1958): *Heterotoma dalmatinus*, *H. meriopterum* (partim) (cat., distr.).
Gogala & Moder (1960): *Heteroptera meriopterum* (faun., Slovenia).
Josifov (1960): *Heterotoma meriopterum* (cat., Bulgaria).
Tamanini (1962): *Heterotoma meriopterum*, *H. meriopterum* f. *dalmatina* (tax., redescr., genitalia, fig., distr., faun., Italy, Croatia, Slovenia, Turkey).
Sienkiewicz (1964): *Heterotoma meriopterum* (partim) (faun., Romania).
Wagner & Weber (1964): *Heterotoma dalmatina* (key).
Servadei (1967): *Heterotoma dalmatinum*, *H. meriopterum* (cat., distr., Italy).
Wagner (1968): *Heterotoma dalmatinum*, *H. dalmatinum* var. *tamaninii* var. nov. (unavailable name) (tax., key, redescr., genitalia, fig., faun., Turkey).
Josifov (1970): *Heterotoma meriopterum* (cat., Albania).
Steyskal (1973): *Heterotoma merioptera* (nom.).
Josifov (1974a): *Heterotoma meriopterum* (ecol., faun., Bulgaria).
Josifov (1974b): *Heterotoma meriopterum* (ecol., faun., Bulgaria).
Wagner (1974): *Heterotoma dalmatinum*, *H. dalmatinum* var. *tamaninii* var. nov. (key, redescr., genitalia, fig., distr.).
Schneider (1976): *Heterotoma meriopterum* (bion., faun., Romania).
Dioli (1979): *Heterotoma dalmatinum* (faun., Italy).
Herczek (1979): *Heterotoma silesiaca* sp. nov. (partim – specimens from Lubliniec) (descr., tax., genitalia, fig., ecol., faun., Poland) [syn. Melber *et al.* 1991, Gorczyca & Hercek 1994].
Tamanini (1982): *Heteroptera meriopterum* (faun., Italy).
Mildner (1983): *Heteroptera meriopterum* (faun., Austria). The voucher specimen was not revised (W. Rabitsch, pers. comm.), but recent occurrence of *H. merioptera* in Carinthia was confirmed (Rabitsch 2003a).
Gogala & Gogala (1986): *Heteroptera dalmatinum* (ecol., list, faun., Slovenia).
Josifov (1986): *Heterotoma meriopterum meriopterum*, *H. meriopterum dalmatinum* (list, distr., Balkan Peninsula).
Ribes & Goula (1986): *Heterotoma dalmatinus, H. dalmatinus* var. *tamaninii* (type location, faun., Croatia, Turkey).
Gogala & Gogala (1989): *Heteroptera meriopterum dalmatinum* (list, faun., Slovenia).
Goula (1990): *Heterotoma merioptera* (nom., tax., key, descr., genitalia, fig., distr., faun., Bulgaria, Croatia, Turkey).
Günther (1990): *Heterotoma meriopterum* (faun., Greece).
Günther & Schuster (1990): *Heterotoma meriopterum* (list, distr., Central Europe).
Melber *et al.* (1991): *Heterotoma meriopterum*, *H. silesiaca* syn.nov. (tax., distr., faun., Austria).
Linnavuori (1992): *Heterotoma meriopterum* (faun., Iraq).
Gorczyca & Herczek (1994): *Heterotoma merioptera* (tax., faun., Poland).
Strpić (1995): *Heterotoma dalmatina* (faun., Croatia).
Faraci & Rizzotti Vlach (1995): *Heterotoma meriopterum* (list, distr., Italy).
Furlan & Gogala (1995): *Heterotoma meriopterum* (faun., Croatia).
Schuh (1995): *Heterotoma merioptera* (cat., distr.).
Heiss (1996): *Heterotoma meriopterum* (ecol., faun., Italy).

Kerzhner (1996): *Capsus* (*Heterotoma*) *dalmatinus* (list of types, Museum Vienna).
Heiss (1997): *Heterotoma meriopterum* (ecol., faun., Austria).
Kondorosy & Földessy (1998): *Heterotoma meriopterum* (faun., Hungary).
Lis & Lis (1998): *Heterotoma meriopterum* (cat., faun., Poland).
Protić (1998): *Heterotoma meriopterum* (cat., Slovenia, Croatia, Bosnia Herzegovina, Serbia, Macedonia).
Kerzhner & Josifov (1999): *Heterotoma merioptera* (cat., distr., Palaearctic region).
Kondorosy (1999): *Heterotoma meriopterum* (list, Hungary).
Linnavuori (1999): *Heterotoma meriopterum* (ecol., faun., Greece).
Rabitsch (1999): *Heteroptera merioptera* (faun., Austria).
Günther & Schuster (2000): *Heterotoma merioptera* (list, distr., Central Europe).
Kondorosy (2001): *Heterotoma meriopterum* (bion., faun., Hungary).
Stănescu (2001): *Heterotoma meriopterum* (bion., cat., faun., Romania).
Bryja *et al.* (2002): *Heteroptera merioptera* (faun., Czech Republic).
Carapezza (2002): *Heterotoma merioptera* (faun., Jordan).
Barić & Ciglar (2003): *Heterotoma merioptera* (bion., ecol., faun., Croatia).
Hoffmann & Melber (2003): *Heterotoma merioptera* (list, Germany – doubtfull record).
Lodos *et al.* (2003): *Heterotoma dalmatinum* (bion., ecol., faun., Turkey).
Protić (2003): *Heterotoma meriopterum* (ecol., fig., Serbia).
Rabitsch (2003a): *Heterotoma merioptera* (faun., Austria).

Heterotoma planicornis (Pallas, 1772)

(Figs 1, 2, 5, 7–8, 11–12; Tabs 1–2, 4–5)

= *Cimex spissicornis* Pallas, 1772
= *Cimex ater* (non Linnaeus, 1758): Geoffroy in Fourcroy (1785) (misidentification)
= ?*Acanthia crassicornis* Fabricius, 1794
= ?*Cimex crassipennis* Turton, 1802
= *Heterotoma acinaciformis* O. Costa, 1839
= *Heterotoma merioptera* (non Scopoli, 1763): many authors (misidentifications)

Material examined. Neotype: Male, glued on piece of card. Abdomen with genitalia in glycerol placed in PVC microvial pinned under specimen. Labels: 'AMERONGEN Utr / Zuijlenstein / 15-8-1987 / B. Aukema // Heterotoma / planicornis / (Fallén) / Det. B. Aukema // ♂ // NEOTYPUS / *HETEROTOMA* / *PLANICORNIS* / (Pallas, 1772) / des. P. Kment & J. Bryja 2004'. Terra typica: Netherlands, Utrecht province; geographical coordinates 51°59'N 05°27'E. Deposited in ZMAN. Here designated.

Male genitalia of the neotype are figured (Fig. 3 – spicula of the penis, Fig. 5 – right paramere, Fig. 7 – left paramere); for measurements see Table. 2. The habitus of the species has been described, for example, by Wagner (1950, 1968, 1971, as *H. merioptera*), Southwood & Leston (1959), Tamanini (1962), Goula (1990), and Wheeler & Henry (1992).

Additional material: Czech Republic, **Bohemia. 5247** – Grunewald [= Pastviny], 804 m a.s.l., 17.vii.1932, 3 ♀♀; ditto, 31.vii.1932, 1 ♀, both without collector, P. Kment det. (NMPC). **5250** – Jílové – Sněžník, 600 m a.s.l., garden, yellow pan trap, 10.ix.2004, 1 ♀, E. Kula lgt., P. Kment det. (PKPC). **5253** – Chotovice, 300 m a.s.l., 21.–24.vii.2004, 1 ♀, J. Růžička lgt. (JRPC). **5548** – Měrunice, ruderal vegetation, 425 m a.s.l., 17.viii.1987, 1 ♂, without collector, P. Kment lgt. (NMPC). **5549** – Vlastislav, 287 m a.s.l., 24.vii.1977, 1 ♀, M. Slouková lgt., P. Kment det. (NMPC). **5650** – Mšené – lázně, 213 m a.s.l., 17.vii.1975, 1 ♀, Z. Jindra lgt., P. Kment det. (ZJPC). **5748** – Třeboc, Džbán Hill, 400–536 m a.s.l., 30.vii.1991, 1 ♀, V. Švihla lgt., P. Kment det. (NMPC). **5852** – Klecany, steppe by cottages, 200–250 m a.s.l., 23.vii.1996, 1 ♀, J. Vilímová lgt., J. Bryja det. (JBSC); Praha – Bubeneč, 221 m a.s.l., vii–viii.1990, 1 ♂; ditto, 17.viii.1997, 1 ♂, both P. Kapitola lgt., K. Hradil det. (KHMC); Praha – Lysolaje, Housle NM, 300–310 m a.s.l., 22.vii.1999, 1 ♂, O. Balvín lgt., P. Kment det. (OBPC); Praha – Trója, 187 m a.s.l., 7.viii.1986, 1 ♂, Z. Jindra lgt., P. Kment det. (ZJPC); ditto, Trojský ostrov Island, 176 m a.s.l., 4.viii.1991, 1 ♂, P. Kapitola lgt., K. Hradil det. (KHMC). **5857** – Hradčany, 223 m a.s.l., 25.vii.1971, 1 ♂, O. Kubík lgt., P. Kment det. (OKKC); Žehuň, 204 m a.s.l., 25.vii.1975, 2 ♂♂, O. Kubík

lgt., P. Kment det. (OKKC). **5951** – Praha – Ruzyně, 326 m a.s.l., 19.vii.1976, 1 ♀, A. Honěk lgt., P. Kment det. (VURV); ditto, 29.vi.1979, 1 ♂, Z. Jindra lgt., P. Kment det. (ZJPC). **5952** – Praha, 200–330 m a.s.l., 27.vi.1953, 1 ♂ 4 ♀♀, Z. Starý lgt., P. Kment det. (NMPC); Praha – Kunratice, shrubs along the road near student hostel (*Tamarix*, *Elaeagnus*, *Amorpha*), 300 m a.s.l., 10.vii.2002, 3 ♀♀, P. Kment lgt. & det. (PKPC); Praha – Strahov (5952), Malý stadion, ruderal vegetation, 330 m a.s.l., 6.vii.2002, 1 ♂, J. Růžička lgt., P. Kment det. (PKPC). Praha – Žižkov, 250 m a.s.l., viii.1994, 1 ♀, J. Vilímová lgt., P. Kment det. (JVPC). **5953** – Praha – Kyje, part Jahodnice, 230–240 m a.s.l., 1.ix.1975, 1 ♂, J. Přeučilová lgt., J. Bryja det. (JBSC). **5957** – Choťovice, 204 m a.s.l., 9.ix.1972, 1 ♂, O. Kubík lgt., P. Kment det. (OKKC); Kolín, 205 m a.s.l., 13.viii.1973, 1 ♂; ditto, 18.vii.1994, 1 ♂, both O. Kubík lgt., P. Kment det. (OKKC); Kolín V, 200 m a.s.l., 21.vii.1951, 1 ♂; ditto, 20.vii.1952, 1 ♂, both O. Kubík lgt., P. Kment det. (OKKC). **5958** – Bernardov, 235 m a.s.l., 24.viii.1974, 1 ♂ 1 ♀, O. Kubík lgt., P. Kment det. (OKKC). **6052** – Praha – Strnady, 200–250 m a.s.l., 1.vii.1999, 1 ♂, K. Hradil lgt. & det. (KHMC). **6057** – Kutlíře, 263 m a.s.l., 5.viii.1957, 3 ♀♀, O. Kubík lgt., P. Kment det. (OKKC); Kutná Hora, Kaňk Hill, 250–352 m a.s.l., 30.vii.1963, 1 ♂ 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC); Kutná Hora, Kuklík Hill, 300–359 m a.s.l., 2.viii.1963, 3 ♀♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **6058** – Horušice, 228 m a.s.l., 6.vii.1969, 1 ♀, O. Kubík lgt., P. Kment det. (OKKC). **6159** – Kubíkovy Duby, 419 m a.s.l., 16.viii.1986, 1 ♂; ditto, 14.viii.1989, 1 ♀; ditto, 14.vii.1990, 2 ♂♂; ditto, 15.vii.1991, 2 ♂♂ 1 ♀; ditto, 30.viii.1991, 1 ♀, all O. Kubík lgt., P. Kment det. (OKKC). **6254** – Benešov, 360 m a.s.l., 31.vii.1973, 3 ♀♀, Z. Jindra lgt., P. Kment det. (ZJPC). **6256** – Horka nad Sázavou, 348 m a.s.l., 28.vii.1983, 2 ♀♀, O. Kubík lgt., P. Kment det. (OKKC). **6358** – Lipnice nad Sázavou, 590 m a.s.l., 28.vii.1991, 2 ♂♂, P. Kapitola lgt., K. Hradil det. (KHMC).

Czech Republic, Moravia (incl. Silesia). **6073** – Otice, 258 m a.s.l., 14.viii.1976, 1 ♂, B. Dobšík lgt., P. Kment det. (MMBC). **6074** – Dolní Benešov, 231 m a.s.l., 16.vii.1976, 1 ♀, B. Dobšík lgt., P. Kment det. (MMBC). **6275** – Ostrava – Hrabová, mining heap, 280 m a.s.l., 23.viii.1981, 1 ♀, M. Roháčová lgt., P. Kment det. (BMFC). **63–6468** – Náměšť na Hané, 250 m a.s.l., 1.viii.2004, 1 ♂, M. Krist lgt., P. Kment det. (VMOC). **6369** – Štěpánov, 224 m a.s.l., 5.vii.1981, 1 ♂, Meduna lgt., P. Kment det. (MMBC). **6561** – Netín, SW margin of Vrkoč Pond, peatbog with *Carex* spp. growth on pond margins, 518 m a.s.l., 22.viii.1978, 3 ♀♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **65–6661** – Závist, SE margin of Netínský rybník Pond, growth with *Sphagnum* sp., *Carex* sp., *Glyceria* sp., *Salix aurita, Frangula alnus, Picea excelsa* and *Pinus sylvestris*, 516 m a.s.l., 22.viii.1978, 1 ♂ 1 ♀, P. Lauterer & L. Pospíšilová lgt., P. Kment det. (MMBC). **6563** – Zlatkov, garden, on *Ribes nigrum*, 564 m a.s.l., 20.vii.2003, 1 ♂ 3 ♀♀, J. Bryja lgt. & det. (JBSC). **6661** – Lavičky, xerothermic slopes, 480–530 m a.s.l., 9.vii.1981, 4 ♂♂, J. L. Stehlík lgt., P. Kment det. (MMBC); Olší nad Oslavou, 'U Buku', ruderalized xerothermic growth on hill top, 525 m a.s.l., 22.viii.1978, 6 ♂♂ 7 ♀♀, J. L. Stehlík & L. Pospíšilová lgt., P. Kment det. (MMBC). **6662** – Ořechov, Ořechovský rybník Pond, surrounding vegetation, 550 m a.s.l., 16.viii.1979, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC); ditto, environs of Tvrzský rybník Pond, *Caricetum*, 548 m a.s.l., 16.viii.1979, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC); Velké Meziříčí, Vrchovec hill, southern steppe slopes on syenite, 500–549 m a.s.l., 6.viii.1981, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **6663** – Heřmanov, peaty meadows and small pond, 630–640 m a.s.l., 20.ix.1978, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC); Skryje, alluvium of the Loučka river, 350–360 m a.s.l., 8.viii.1978, 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6760** – Červená Lhota, valley and hedges with shrubs and trees, 510–570 m a.s.l., 18.vii.1977, 2 ♂♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6761** – Hostákov, 0.5 km N of the village, partly forested steppe enclaves on tops of small hills, 450–460 m a.s.l., 12.viii.1975, 4 ♂♂ 7 ♀♀, Dočekalová lgt., P. Kment det. (MMBC); Pocoucov, Syenitové skály NM rocks, steppe patches on stony ground, 440–460 m a.s.l., 30.vii.1975, 1 ♂ 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC); Rudíkov, 1 km SW of the village, margins of small woods, hedgerows in fields on stony scree, meso- and xerothermous slopes, 560–570 m a.s.l., 30.viii.1979, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC); Trnava, 'Na Žlíbkách', steppe bouldery enclaves on syenite and ameliorate peaty meadows, 480 m a.s.l., 7.ix.1977, 1 ♂, J. L. Stehlík lgt.; ditto, Březina Pond env., *Caricetum* around the pond and dry bouldery enclaves in fields, 402 m a.s.l., 16.viii.1977, 1 ♂, L. Pospíšilová lgt., both P. Kment det. (MMBC); Valdíkov, shore vegetation around pond, 450 m a.s.l., 29.ix.1976, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC); Vladislav, 'Obecní hory', steep xerothermic slopes towards railway station and along road to Hostákov, 410–440 m a.s.l., 30.viii.1979, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC). **6762** – Budišov, Pyšelák Pond env., 480 m a.s.l., 20.viii.1978, 12 ♂♂ 12 ♀♀, L. Pospíšilová lgt., P. Kment det. (MMBC); Tasov, before 'Za jalovcem', rocky slopes, 446 m a.s.l., 27.viii.1975, 1 ♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **6765** – Brno – Stránice, Wilsonův les Wood, 200–250 m a.s.l., 4.viii.1969, 1 ♂, L. Pospíšilová lgt., P. Kment det. (MMBC); Brno – Židenice, above

cemetery, slope with xerothermic vegetation, 250–280 m a.s.l., 16.vii.1986, 1 ♂ 3 ♀♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **6860** – Kojetice, 1 km NW of the village, banks of Rokytná river, shore growth and trees (*Alnus glutinosa*, *Salix* sp.), 485 m a.s.l., 19.vii.1976, 1 ♂, P. Lauterer lgt., P. Kment det. (MMBC); Rokytnice nad Rokytnou, small steppe and ruderal site, 550–570 m a.s.l., 14.viii.1978, 2 ♀♀, L. Pospíšilová lgt., P. Kment det. (MMBC). **6865** – Brno – Bosonohy (1 km NW), surroundings of Leskava brook, sweeping, 305 m a.s.l., 3.ix.2004, 1 ♀, I. Malenovský & L. Dembický lgt., P. Kment det. (PKPC); Brno – centre, under Červený kopec Hill, bank of the Svratka river, on *Alnus glutinosa*, 205–210 m a.s.l., 14.vii.1967, 1 ♂; Brno – centre, Poříčí Street, bank of the Svratka river, growth of *Atriplex tatarica*, 205 m a.s.l., 15.viii.1984, 3 ♀♀, both P. Lauterer lgt., P. Kment det. (MMBC); Brno – centre, Náměstí 25. února Square (= Zelný trh Square), 240 m a.s.l., 23.vii.1959, 2 ♀♀, J. L. Stehlík lgt., P. Kment det. (MMBC); Brno – Černovice, sandpit, 200–220 m a.s.l., 26.vii.1989, 1 specimen (newly hatched), J. L. Stehlík lgt., P. Kment det. (MMBC); Brno – Pisárky, exhibition ground, ruderal on rubbish heap, 210–220 m a.s.l., 14.viii.1962, 1 ♂ 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC); Brno – Staré Černovice, ruderal on rubbish heap, 230–240 m a.s.l., 1.viii.1962, 1 ♀, P. Lauterer lgt., P. Kment det. (MMBC); Brno – Stránice, Žlutý kopec Hill, 270 m a.s.l., 10.viii.1940, 1 ♂, without collector; ditto, 14.viii.1942, 2 ♂♂, Šnoflák lgt.; ditto, 12.vii.1951, 1 ♀, J. L. Stehlík lgt.; ditto, 15.vii.1952, 1 ♂ 4 ♀♀, J. L. Stehlík lgt.; ditto, garden, *Corylus avellana*, *C. maxima* and *Tilia cordata*, 9.vii.1957, 1 ♀, P. Lauterer lgt.; ditto, 13.vii.1959, 3 ♂♂ 9 ♀♀, J. L. Stehlík lgt.; ditto, 8.ix.1955, 1 ♀, J. L. Stehlík lgt.; ditto, 3.viii.1959, 1 ♂, J. L. Stehlík lgt.; ditto, 8.viii.1959, 1 ♂, J. L. Stehlík lgt.; ditto, 10.viii.1959, 1 ♂ 1 ♀, J. L. Stehlík lgt.; ditto, 7.vii.1961, 4 ♂♂ 9 ♀♀, P. Lauterer lgt.; ditto, *Buxus sempervirens*, *Corylus avellana* and *C. maximus*, 3.viii.1962, 3 ♂♂, P. Lauterer lgt.; ditto, 30.vii.1977, 1 ♂ 2 ♀♀, L. Pospíšilová lgt.; ditto, 26.viii.1964, 2 ♀♀, L. Pospíšilová lgt.; ditto, Preslova Street, ruderal communities, 4.viii.1969, 1 ♀, L. Pospíšilová lgt., all det. P. Kment (MMBC); Brno – Štýřice, *Tamarix* sp. and *Lycium barbarum*, 220 m a.s.l., 2.viii.1973, 1 ♀; ditto, *Elaeagnus angustifolia*, 220–230 m a.s.l., 6.vii.1983, 1 ♂ 1 ♀, both P. Lauterer lgt., P. Kment det. (MMBC). **6866** – Brno – Slatina, Stránská skála Hill, steppe on limestone, partly cultivated, 250–300 m a.s.l., 6.viii.1975, 1 ♂ 3 ♀♀, P. Lauterer lgt., P. Kment det. (MMBC). **6867** – Letonice, Větrník Hill, herb-rich steppe, 290–320 m a.s.l., 22.vii.1971, 2 ♂♂ 1 ♀, J. L. Stehlík lgt., P. Kment det. (MMBC). **7070** – Veselí nad Moravou, railway station, hedge of *Ulmus minor*, 176 m a.s.l., 29.vi.2001, 1 ♂, P. Kment & I. Malenovský lgt., P. Kment det. (PKPC). **7162** – Kyjovice (towards Těšetice), Unanovka river valley and S slopes above the dam: mosaic of ruderal sites, xerothermic meadows, fields and wood margins, 230–280 m a.s.l., 20.viii.1984, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC); Znojmo – Suchohrdly, 'Purkrábka', forest margin, 280–290 m a.s.l., 1.viii.1984, 1 ♀, P. Raus lgt., P. Kment det. (MMBC). **7163** – Lechovice, floodplain forest and pond, 198 m a.s.l., 1.viii.1977, 1 ♂, J. L. Stehlík lgt., P. Kment det. (MMBC).

France. Corse, Filitosa, N of Propriano (41°40'N 8°54'E), 16.vi.1993, 2 ♂♂, P. Kapitola lgt., K. Hradil det. (KHMC); Corse, Rizzanese river, 3 km N Sartène (41°38'N 8°57'E), 18.vi.1993, 3 ♂♂, P. Kapitola lgt., K. Hradil det. (KHMC); Massif Central, Sévérac-le-Château, Pomairols (44°18'N 3°01'E), shrubs and pasture margin, 15.viii.2000, 1 ♀, J. Bryja lgt. & det. (JBSC).

Germany. Berlin env. (52°31'N 13°24'E), summer 1931, 1 ♀, without collector, P. Kment det. (NMPC).

Great Britain. London (51°31'N 0°06'W), 1948, 1 ♂, Macek lgt., P. Kment det. (NMPC).

Greece. Antikira (locality not identified), 3.v.1979, 1 ♂, Mr. & Ms. Hladil lgt., P. Kment det. (MMBC); Peloponnesos, Gythion (36°45'N 22°34'E), 13.–16.v.1979, 1 ♂ 2 ♀♀, Mr. & Ms. Hladil lgt., P. Kment det. (MMBC).

Netherlands. Gelderland Province, Doorwerth (51°59'N 05°51'E), Omg. Kasteel [= near Castle], 2.vii.1988, 1 ♂, B. Aukema lgt. & det. (ZMAN).

Sweden. Lund, 20.vii.1939, 1 ♀, F. Ossiannilsson lgt. & det. as *H. meriopterus*, P. Kment revid. (MMBC).

Distribution in the Czech Republic (Fig. 8) **and Slovakia.** TAMANINI (1962) listed *H. planicornis* from the former Czechoslovakia without giving any exact locality. There are only four records of *H. planicornis* from the Czech Republic: Brno – Žabovřesky [in fact Brno – Stránice, Žlutý kopec Hill] (6865) (STEHLÍK 1945, as *H. meriopterum*; voucher specimen in MMBC, revised), Vlčák (5151) (BRYJA & KULA 2000, as *H. meriopterum*, revised), Horoměřice (5852) (KINKOROVÁ & KOCOUREK 2000), and Nové Osinalice (5552) (BRYJA & KMENT *in press*). It is more widespread in the Czech Republic than *H.*

merioptera, common especially at higher altitudes. However, it is more rare than *H. merioptera* in the warmest lowlands, where *H. planicornis* is limited to ruderal and synanthropic habitats. Although *H. planicornis* and *H. merioptera* are widely sympatric in the Czech Republic and they have been found very close to each other (e.g. in the city of Brno), they have never been found in the same locality. It appears that in warm lowlands *H. merioptera* prefers natural or semi-natural habitats, while *H. planicornis* is characteristic of ruderal sites.

We have seen no specimens of *H. planicornis* in Slovakia, although its occurrence there is very probable. For a list of unrevised records of *H. merioptera*, which may also concern *H. planicornis*, see under *H. merioptera*.

General distribution. Kerzhner & Josifov (1999) summarized the range of *H. planicornis* as covering Austria, Belgium, Bulgaria, the Czech Republic, Denmark, France, Great Britain, Germany, Hungary, Ireland, Italy, Liechtenstein, Luxembourg, Moldavia, the Netherlands, Norway, Poland, Portugal, Romania, Russia (Central and South European Territories), Slovakia, Spain, Sweden, Switzerland, and Ukraine.

Tamanini (1962) also recorded it from Greece ('Levidi nel Peloponneso') and the Asian part of Turkey ('Kizilacahaman', and 'North of Ankara'). The record from Greece was also confirmed by Linnavuori (1999), and material revised in our study. Contrary to Kerzhner & Josifov (1999), we cannot confirm the occurrence of *H. planicornis* in Slovakia. Kondorosy (1999) mentioned both *H. merioptera* and *H. planicornis* from Hungary – *H. merioptera* with reference to Horváth (1897), and *H. planicornis* with reference to Kerzhner & Josifov (1999). This situation may indicate that no exact material of the latter species from Hungary was known to him. A record from Croatia was added by Barić & Ciglar (2003).

In the Nearctic region, *H. planicornis* was recorded by Knight (1917) as *H. merioptera.* The specimen was taken on the property of one of the large importing nursery firms situated at Honeoye Falls in New York. Given the circumstances of collection, Knight (1917) considered it to be introduced from Europe. All subsequent authors (e.g., Downes 1957; Gagné 1983; Henry & Wheeler 1988; Kelton 1957, 1982; Messing & Ali Niazee 1985, 1986) accepted the name *H. merioptera*. The *Heterotoma* specimens from North America were revised by Wheeler & Henry (1992), who corrected their identity to *H. planicornis*. The known distribution of *H. planicornis* in the Nearctic includes the USA (California, New York, Oregon, Pennsylvania, Washington) and Canada (British Columbia, Nova Scotia) (Knight 1917, Kelton 1982, Henry & Wheeler 1988, Wheeler & Henry 1992). It is highly probable that *H. planicornis* was introduced to North America from Europe (Knight 1917, Scudder 1960, Wheeler & Henry 1992). It was also introduced to Hawaii (Gagné 1983).

Biology and phenology. *Heterotoma planicornis* is a zoophytophagous species (Wagner 1952, 1974; Wagner & Weber 1964; Collyer 1953; Southwood & Scudder 1956; Southwood & Leston 1959; Dempster 1960; Korcz 1967; Göllner-Scheiding 1992; Gorczyca & Herczek 1994; etc.). According to Southwood & Leston (1959), both larvae and adults are predatory on aphids and other small insects, besides feeding on the buds and unripe fruits of various plants. Merrifield (1906) reported both larvae and

adults sucking on butterfly eggs. Messing & AliNiazee (1986) counted the mean number of aphids (4.5–25.7) eaten by one *H. planicornis* per day. Both larvae and adults prey on various stages of various small arthropods; for a review see Table 4. Dempster (1960) confirmed the zoophytophagy of *H. planicornis* using precipitation antibodies, although only 2.2 % of the meals tested reacted with anti-*Gonioctena* (Chrysomelidae), and 3.8 % with anti-*Cytisus* (Fabaceae) sera. The species has also been observed sucking sap from the plant tissues of *Prunus spinosa*, *Rubus* sp. (both Rosaceae), *Urtica dioica* (Urticaceae) (Kullenberg 1946), *Malus domestica* (Rosaceae) (Collyer 1953, Massee 1954), *Calluna vulgaris* (Ericaceae) (Strawiński 1964a, 1966), and *Vaccinium myrtillus* (Vacciniaceae) (Strawiński 1964b).

It overwinters in the egg stage (Reichert 1919; Kullenberg 1946; Wagner 1952, 1974; Southwood & Leston 1959; Wagner & Weber 1964; Massee 1954; Kelton 1982; Ehanno 1987; Gorczyca & Herczek 1994). The egg was figured by Kullenberg (1942) and Collyer (1953), who observed oviposition into young apple wood. On pear trees, the eggs are laid in young twigs, so the pruning of pear trees in winter could significantly depress its population in orchards (Herard 1986). Abraham (1937) reported oviposition in currant shoots. Larval development has been observed on 11 plant taxa belonging to 7 families (see Table 5). The larva has been described and figured by Reichert (1919), Butler (1923), Collyer (1953), van Dinther (1953), and Southwood & Scudder (1956).

There is only one generation per year (Wagner 1974, Ehanno 1987, Gorczyca & Herczek 1994, etc.). In the Czech Republic, adults start to appear in third decade of June, reach their first peak in the second decade of July and a second peak in the second decade of August, and than disappear continuously up to the end of September (Fig. 11). However, this bimodality is almost certainly an artefact of our data set. The earliest Czech record is from 25th June (Prague), the latest one from 29th September (Valdíkov). The phenological data of other authors generally agree with ours. Most authors cite records of adult *H. planicornis* in July and August, less frequently in September (Austria – Franz & Wagner 1961; Rabitsch 2003b, 2004, 2005; Azores – Lindberg 1941; Canada – Waloff 1966; Kelton 1982; Germany – Burghardt 1973; Göllner-Scheiding 1968, 1970, 1974, 1992; Goula 1990; Gulde 1921; Günther 1988b; Michalk 1938; Reichert 1919; Singer 1952; Schuster 1971, 1986, 1990, 1993, 1998, 2001; Wagner 1937; Zeletzki & Rinnhofer 1966; Great Britain – Pollard 1968; Southwood & Scudder 1956; Southwood & Leston 1959; Southwood 1960; Italy – Rizzotti Vlach 1994; Poland – Strawiński 1962, 1963, 1966; Korcz 1967; Spain – Goula 1990; Ribes & Goula 1995; Sweden – Coulianos 1983; Kullenberg 1946). Butler (1923), Wagner (1952, 1974) and Massee (1954) gave the life-span from July to October. However, in warmer parts of its range, the adults appear from mid-June onwards: 10th June (Romania – Stănescu 2001), 10th June – 22nd July (southern France – Coffin & Matocq 2004), 16th June – 31st July (Switzerland – Wyniger & Burckhardt 2003), 23rd June (Asian Turkey – Lodos *et al.* 2003), or 28th June (Austria – Rabitsch 2004). Tamanini (1981) listed two specimens collected in Basilicata (southern Italy) in May [19]57 (without additional details) as well as additional specimens collected in June, July

and August. HERARD (1985) wrote that *H. planicornis* occurred from mid-May to late July with a peak in late June at Avignon and in mid-July at Toulouse; however, it is not clear whether his data refer to adults only, or pool larvae and adults together. The same situation must also pertain to MERRIFIELD (1906), who gave a life span from May to August, with a maximum in June and July; it is certain that he observed both larvae and adults. EHANNO (1987) summarized the occurrence of adults in France from mid-June to mid-September. STRAWIŃSKI (1966) gave its occurrence in Poland 'in July and August, rarely in June'; similarly GORCZYCA & HERCZEK (1994) gave the life-span in Poland as 'June to September – depending on region'. HILL (1952) collected an adult in Scotland as late as 15th October. GAGNÉ (1983) recorded *H. planicornis* in tropical Hawaii in April and June.

Information about the larval development remains unsufficient. COLLYER (1953) wrote: 'Nymphs hatch from the third week in May until September.' However, SOUTHWOOD & SCUDDER (1956) observed: 'Such a long hatching period in overwintered eggs would be quite exceptional. We have not found any evidence to support such a view and consider that the eggs hatch in late May to early June and most larvae become adults between the second week of July and the first week of August.' (see also SOUTHWOOD & LESTON 1959). The opinion of SOUTHWOOD & SCUDDER (1956) seems to be supported by data from other authors. HALBERT (1935) mentioned both larvae and adults on *Rubus* sp. in Ireland in the end of July. HILL (1952) recorded that larvae appear about the middle of July and adults from early August until early autumn on apple trees in Scotland. POLLARD (1968), studying hawthorn hedges in Great Britain, collected larvae in June, July, and at the beginning of August, while adults occurred from the end of July to the beginning of September. KORCZ (1967) observed larvae in Poland in June, as did REICHERT (1919) in Germany, and WALOFF (1966) and KELTON (1982) in Canada. In Germany, GULDE (1921) reported larvae and newly hatched adults on willows on 2nd July and larvae on *Prunus spinosa* and *Acer* sp. on 5th July, and SINGER (1952) observed larvae on 16th July. According to EHANNO (1987), larvae occur in France from mid-June to the beginning of July, and possibly as early as mid-May.

The life-cycle of *H. planicornis* may well correspond with the life-cycles of its potential prey. For example, MESSING & ALI NIAZEE (1986) described the population dynamics of the aphid prey *Myzocallis coryli* (Goetze, 1778) in the USA (Oregon): In May and the first half of June the population density of aphids is low, rising towards the middle of August, and falling thereafter. The population growth/decline of the aphid was followed by population growth/decline in its predators, including *H. planicornis*.

In our material, there were slightly more females than males throughout the season (Fig. 11). Compared with *H. merioptera* (Fig. 10), *H. planicornis* starts to occur later and survives until the end of September, which is in agreement with published records (mid-July – mid-October).

Ecology. In the Czech Republic, the species was found in various habitats. In warm lowlands, it most often occurs in ruderal habitats, mining heaps, sandpits, gardens or on shrubs along roads. It also inhabits various habitats outside cities, e.g. xerothermic slopes and small steppes (usually above 400 m a.s.l.), hedges with shrubs and trees, forest

margins, floodplain forests, river banks, vegetation around ponds (including small peatbogs) and peaty meadows. The vertical distribution of *H. planicornis* is deeper than that of *H. merioptera* (Fig. 12); it is the sole species found above 550 m a.s.l. Between 150 and 200 m a.s.l. it is more rare than *H. merioptera*. The highest number of records occurred between 201 and 250 m a.s.l., but it is quite common up to 650 m a.s.l. We also registered one record from the Krušné hory Mountains at an altitude of 804 m a.s.l. Goula (1990) mentioned the ocurrence of this species at altitudes of 800–1500 m a.s.l. in Catalonia. Ehanno (1987) wrote that *H. planicornis* is most common at moderate and higher altitudes, but that it also occurs at littoral and subalpine zones in France.

It is generally known in association with trees and shrubs, as well as herbs. It is commonly collected on ruderal vegetation, such as nettles (*Urtica* sp.), broom (*Cytisus scoparius*), and other plants (Wagner 1952, 1974; Massee 1954; Southwood & Scudder 1956; Downes 1957; Southwood & Leston 1959; Ehanno 1987). Within the literature we covered, it was mentioned in association with 58 plant taxa belonging to 31 families (see Tab. 5).

In Poland, it has been recorded as a typical inhabitant of the undergrowth of various forest communities, e.g. *Pineto-Quercetum* (Strawiński 1957, 1962, 1963), *Dicrano-Pinion* (Gorczyca & Herczek 1989), *Querco roboris-Pinetum* (Gorczyca 1994), *Peucedano-Pinetum*, and *Leucobryo-Pinetum* (Cmoluchowa & Lechowski 1993, 1994), often on *Vaccinium myrtillus* (Strawiński 1964a, Gorczyca 1994). In Moldavia, it was found on *Quercetum herbosum* by Derzhansky (2003). On the Friesian Islands (Germany), it was found on low willow and alder growth (Schumacher 1912b). It is also common in non-forest habitats, such as hedgerows (Great Britain – Pollard 1968, Ireland – Halbert 1935), meadows (Germany – Göllner-Scheiding 1974; Ireland – Halbert 1935; Poland – *Cirsio-Brachypodion pinnati* – Herczek 1987), cultivated meadows (Belgium – Colignon *et al.* 2003), agricultural grassland (Switzerland – DiGiulio at al. 2000), dry pastures (Spain – Goula 1990), the edges of cereal fields (Germany – Albrecht 1994; Great Britain – Moreby *et al.* 1997), road margins (Spain – Goula 1990), xerothermic vegetation in disused limestone quarries (Belgium – Dethier *et al.* 2005), as well as ruderals (Germany – Wagner 1952, Albrecht 1994). It has often been recorded from orchards (apple, pear) (Croatia – Barić & Ciglar 2003; Czech Republic – Kinkorová & Kocourek 2000; Denmark – Ravn & Rasmussen 1996; France – Couturier 1972, Malevez 1976, Fauvel & Atger 1981, Herard 1985, 1986; Germany – Zeletzki & Rinnhofer 1966; Great Britain – Collyer 1953; Ireland – Halbert 1935), olive gardens (Greece – Linnavuori 1999), parks and gardens (Austria – Rabitsch 2004; Azores – Lindberg 1941; Germany – Bruelheide & Zucchi 1993, Kott 1993) throughout Europe. Gagné (1983) mentioned adults and larvae from 'various plant species, primary exotic ornamentals' in Hawaii. Ehanno (1987) summarized the habitats of *H. planicornis* in France: it prefers shrubs, hedgerows, and slopes grown with shrubs in inland, but it also occurs in ruderals, dunes, mesohygrophilous and hygrophilous meadows, shrubs on limestones, and in maritime maquis. Of Poland, Gorczyca & Herczek (1994) wrote: *'Heterotoma planicornis* is rather common throughout Poland and probably two populations of this species exist.

One of them is connected with ruderal plant assemblages and usually appears in great numbers on one site. The other one seems to be typical of pine forests and mixed forests undergrowth on *Vaccinium*, *Calluna* and others. This population is less numerous but specimens are more evenly distributed.' This observation is similar to our own in the Czech Republic. However, we do not assume it probable that two discrete populations of *H. planicornis* exist in Central Europe. The local differences appear to be the result of variations in enviromental conditions, such as prey species and their density.

Flying specimens have also been caught in suction traps in England (SOUTHWOOD 1960) and light traps in Germany (GÖLLNER-SCHEIDING 1989).

Selected bibliography of *Heterotoma planicornis*. Because of some inaccuracies in recent literary sources, the following list of referrences is presented. The record of *H. planicornis* from Etna, Italy by D'URSO *et al.* (1984) concerns *H. diversipes* (see GOULA 1990).

The following abbreviations are used in the list: bion. – bionomy (incl. dates of finding), cat. – catalogue, descr. – description, distr. – distribution, ecol. – ecology (incl. 'host' plant records), ethol. – ethology, faun. – faunistics, fig. – figures, morphol. – morphology, nom. – nomenclature, redescr. – redescription, tax. – taxonomy, zoogeo. – zoogeography).

PALLAS (1772): *Cimex planicornis* sp.nov. [descr., Belgium; later precised as Netherlands by PALLAS (1777)].
FABRICIUS (1777): *Cimex spissicornis* sp.nov. (descr., Germany) [syn. A. COSTA 1843].
GEOFFROY in FOURCROY (1785): *Cimex ater* (non Linnaeus, 1758) (misidentification, see REUTER 1888, under *H. meriopterum*).
FABRICIUS (1794): *Acanthia crassicornis* sp.nov. (descr., Germany) [syn. FABRICIUS 1803, with *H. spissicornis*, suspected].
TURTON (1802): *Cimex crassipennis* nom. nov. (new name for *Acanthia crassicornis* Fabricius, 1794 because of the secondary homonymy with *Cimex crassicornis* Linnaeus, 1758).
O. COSTA (1839): *Heterotoma acinaciformis* sp.nov. (descr., Italy) [syn. TAMANINI 1981].
REUTER (1884): *Heterotoma meriopterum* (partim), *H. planicornis* syn.nov. (tax., redescr., fig., ecol., distr.)
PUTON (1899): *Heterotoma merioptera* (partim) (cat.).
MERRIFIELD (1906): *Heterotoma merioptera* (bion., Great Britain).
REUTER (1908): *Heterotoma merioptera* (ecol.).
OSHANIN (1912): *Heterotoma meriopterum* (partim), *H. acinaciforme* (cat., distr.).
SCHUMACHER (1912a): *Heterotoma merioptera* (ecol., faun., Germany).
SCHUMACHER (1912b): *Heterotoma merioptera* (ecol., faun., Germany).
KNIGHT (1917): *Heterotoma merioptera* (faun., USA).
REICHERT (1919): *Heterotoma meriopterum* (redescr., genitalia, larva, figs., bion., ecol., faun., Germany).
GULDE (1921): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
BUTLER (1923): *Heteroptera meriopterum* (bion., ecol., larva, fig., distr., Great Britain).
HALBERT (1935): *Heterotoma meriopterum* (bion., ecol., faun., Ireland).
ABRAHAM (1937): *Heteroptera meriopterum* (ecol., Germany).
WAGNER (1937): *Heteroptera meriopterum* (ecol., faun., Germany).
MICHALK (1938): *Heteroptera meriopterum* (bion., ecol., faun., Germany).
JORDAN (1940): *Heteroptera meriopterum* (ecol., faun., Germany).
LINDBERG (1941): *Heteroptera meriopterum* (bion., ecol., faun., Azores).
KULLENBERG (1942): *Heterotoma meriopterum* (egg, fig., Sweden).
KULLENBERG (1946): *Heterotoma meriopterum* (bion., ecol., faun., Sweden).
KULLENBERG (1947): *Heterotoma meriopterum* (ethol., morphol., male and female genitalia, fig.).
SLATER (1950): *Heterotoma meriopterus* (morphol., female genitalia, faun., Germany).
WAGNER (1950): *Capsus* (*Heterotoma*) *meriopterus* (tax., genitalia, fig.).

HILL (1952): *Capsus meriopterus* (bion., ecol., faun. Great Britain).
SINGER (1952): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
WAGNER (1952): *Heterotoma dalmatina* (key, redescr., bion., ecol., fig.).
COLLYER (1953): *Capsus meriopterus* (bion., ecol., larva, egg, fig., Great Britain).
VAN DINTHER (1953): *Heterotoma meriopterum* (larva, fig., bion., faun., Netherlands).
MASSEE (1954): *Capsus meriopterus* (bion., ecol., faun., Great Britain).
SOUTHWOOD & SCUDDER (1956): *Heterotoma merioptera* (bion., ecol., larva, fig., Great Britain).
WOODROFFE (1956): *Heterotoma meriopterum* (ecol., faun., Great Britain).
DOWNES (1957): *Heterotoma meriopterum* (bion., ecol., faun., Canada).
STRAWIŃSKI (1957): *Capsus meriopterum* (ecol., faun., Poland).
CARVALHO (1958): *Heterotoma meriopterum* (part) (cat., distr.).
SOUTHWOOD & LESTON (1959): *Heterotoma merioptera* (bion., ecol., fig., caryotype, Great Britain, Ireland).
KELTON (1959): *Heterotoma meriopterum* (genitalia, fig., faun., Canada).
DEMPSTER (1960): *Heterotoma merioptera* (bion., faun., Great Britain).
EHANNO (1960): *Heterotoma meriopterum* (bion., faun., France).
SCUDDER (1960): *Heterotoma meriopterum* (zoogeo., Canada).
SOUTHWOOD (1960): *Heterotoma merioptera* (ecol., faun., Great Britain).
WALOFF & SOUTHWOOD (1960): *Heterotoma merioptera* (key to larvae).
FRANZ & WAGNER (1961): *Heterotoma meriopterum* (diagnose, ecol.).
WAGNER (1961): *Heterotoma meriopterum* (diagnose, ecol.).
STRAWIŃSKI (1962): *Heterotoma meriopterum* (bion., ecol., faun., Poland).
TAMANINI (1962): *Heterotoma planicornis* (tax., redescr., genitalia, fig., distr., faun., Italy, Spain, Azores, Netherlands, Germany, Czechoslovakia, Greece, Turkey).
STRAWIŃSKI (1963): *Heterotoma meriopterum* (bion., ecol., faun., Poland).
KERZHNER (1964): *Heterotoma planicorne* (key).
SIENKIEWICZ (1964): *Heterotoma meriopterum* (partim) (faun., France, Italy, Azores; records from Algeria very probably belong to *H. diversipes*).
STRAWIŃSKI (1964a): *Heterotoma meriopterum* (ecol., faun., Poland).
STRAWIŃSKI (1964b): *Heterotoma meriopterum* (bion., ecol., Poland).
WAGNER & WEBER (1964): *Heterotoma meriopterum*, *H. acinaciforme* (key, redescr., genitalia, fig., bion., ecol., distr.).
RIBES (1965): *Heterotoma meriopterum* (bion., faun., Spain).
DEMPSTER (1966): *Heterotoma merioptera* (bion., faun., Great Britain).
STRAWIŃSKI (1966): *Heterotoma meriopterum* (bion., ecol., faun., Poland).
WALOFF (1966): *Heterotoma merioptera* (ecol., faun., Canada).
ZELETZKI & RINNHOFER (1966): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
KORCZ (1967): *Heterotoma meriopterum* (bion., ecol., faun., Poland).
SERVADEI (1967): *Heterotoma acinaciforme* (cat., distr., Italy).
WAGNER (1968): *Heterotoma meriopterum*, *H. acinaciforme* (tax., key, redescr., genitalia, fig.).
GÖLLNER-SCHEIDING (1968): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
POLLARD (1968): *Heterotoma planicornis* (bion., ecol., faun., Great Britain).
GÖLLNER-SCHEIDING (1970): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
SCHUSTER (1971): *Heterotoma merioptera* (ecol., faun., Germany).
TEYROVSKÝ & GÖLLNER-SCHEIDING (1971): *Heterotoma meriopterum* (zoogeo., faun., Germany).
COUTURIER (1972): *Heterotoma meriopterum* (ecol., faun., France).
GÖLLNER-SCHEIDING (1972): *Heterotoma meriopterum* (faun., Germany).
BURGHARDT (1973): *Heterotoma meriopterum* (bion., faun., Germany).
ANDERSEN & GAUN (1974): *Heterotoma planicornis* (*merioptera* auctt.) (list, Denmark).
FAUVEL (1974): *Heterotoma meriopterum* (bion., ecol., France).
GÖLLNER-SCHEIDING (1974): *Heterotoma meriopterum* (bion., ecol., faun., Germany).
SLATER (1974): *Heterotoma meriopterus* (zoogeo., USA).
STRAWIŃSKI (1974): *Heterotoma meriopterum* (ecol., faun., Poland).
WAGNER (1974): *Heterotoma meriopterum*, *H. acinaciforme* (key, redescr., genitalia, fig., bion., ecol., distr.).
FAUCHEUX (1975): *Heterotoma meriopterum* (morphol., fig., ?France).

Coulianos & Ossiannilsson (1976): *Heterotoma planicornis* (list, distr., Sweden).
Malevez (1976): *Heterotoma merioptera* (bion., ecol., faun., France).
Roshko (1976): *Heterotoma planicorne* (distr., Ukraine).
Herczek (1979): *Heterotoma silesiaca* sp.nov. (partim – specimens from Ciężkowice), *H. meriopterum* (fig., ecol., faun., Poland) (see Gorczyca & Herczek 1994).
Carapezza (1981): *Heterotoma planicornis* (bion., ecol., faun., Italy).
Fauvel & Atger (1981): *Heterotoma merioptera* (bion., ecol., faun., France).
Tamanini (1981): *Heterotoma planicorne, H. acinaciformis* syn. nov. (tax., bion., faun., Italy).
Kelton (1982): *Heterotoma meriopterum* (bion., ecol., fig., distr., Canada).
Coulianos (1983): *Heterotoma planicornis* (bion., ecol., faun., Sweden).
Gagné (1983): *Heterotoma meriopterum* (ecol., faun., USA: Hawaii).
Herard (1985): *Heterotoma meriopterum* (bion., ecol., France).
Nau (1985): *Heterotoma meriopterum* (larva, Great Britain).
Messing & Ali Niazee (1985): *Heterotoma meriopterum* (bion., ecol., USA).
Goula (1986): *Heterotoma planicornis* (ecol., faun., Spain).
Herard (1986): *Heterotoma meriopterum* (bion., ecol., faun., France).
Messing & Ali Niazee (1986): *Heterotoma meriopterum* (bion., ecol., USA).
Schuster (1986): *Heterotoma planicornis* (bion., ecol., faun., Germany).
Ehanno (1987): *Heterotoma meriopterum* (bion., ecol., distr., France).
Herczek (1987): *Heterotoma meriopterum* (ecol., faun., Poland).
Herczek & Nakonieczny (1987): *Heterotoma meriopterum* (ecol., faun., Poland).
Günther (1988a): *Heterotoma planicornis* (faun., Germany).
Günther (1988b): *Heterotoma planicornis* (bion., faun., Germany).
Henry & Wheeler (1988): *Heterotoma merioptera* (cat., Canada, USA).
Göllner-Scheiding (1989): *Heterotoma planicornis* (ecol., faun., Germany).
Gorczyca & Herczek (1989): *Heterotoma planicornis* (ecol., faun., Poland).
Lis (1989): *Heterotoma meriopterum* (ecol., faun., Poland).
Aukema (1990): *Heterotoma planicornis* (list, distr., Netherlands).
Goula (1990): *Heterotoma planicornis* (tax., key, genitalia, fig., bion., ecol., distr., faun., Germany, Spain).
Günther & Schuster (1990): *Heterotoma planicornis* (list, distr., Central Europe).
Schuster (1990): *Heterotoma planicornis* (bion., ecol., faun., Germany).
Bröring (1991): *Heterotoma planicornis* (bion., ecol., faun., Germany).
Melber *et al.* (1991): *Heterotoma planicornis* (faun., Austria).
Göllner-Scheiding (1992): *Heterotoma planicornis* (bion., ecol., faun., Germany).
Hoffmann (1992): *Heterotoma planicornis* (ecol., faun., Germany).
Kott & Hoffmann (1992): *Heterotoma planicornis* (list, cat., Germany).
Wheeler & Henry (1992): *Heterotoma planicorne* (bion., ecol., fig., distr., zoogeo., faun., Canada, USA).
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Cmoluchowa & Lechowski (1993): *Heterotoma meriopterum* (ecol., faun., Poland).
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RABITSCH (2005): *Heterotoma planicornis* (bion., faun., Austria).
RIBES & BORGES (2005): *Heterotoma planicornis* (list, distr., Azores).
SCHUSTER (2005): *Heterotoma planicornis* (faun., Germany).

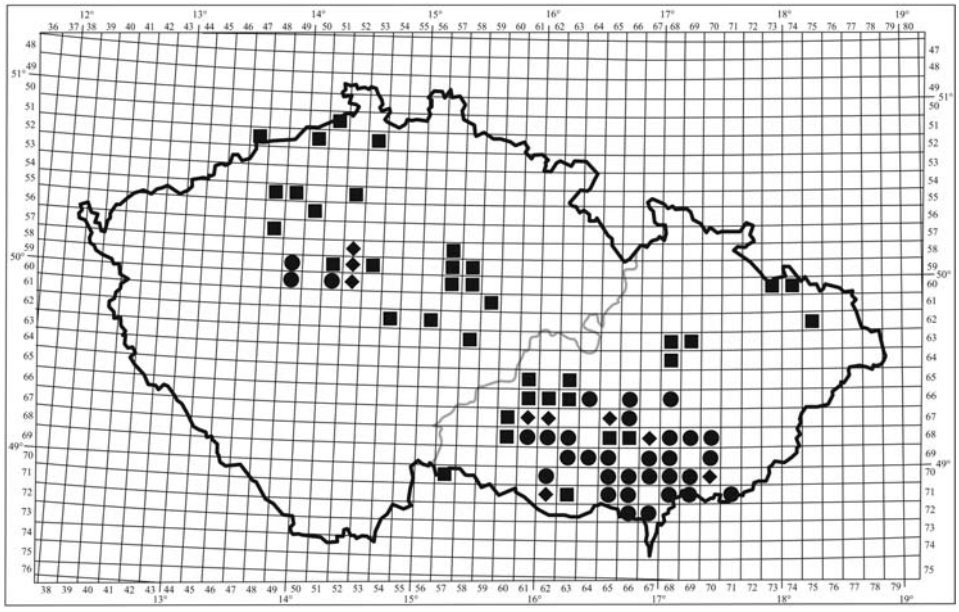

Fig. 8. Distribution of *Heterotoma merioptera* (Scopoli, 1763) (black points) and *H. planicornis* (Pallas, 1772) (black squares) in the Czech Republic. Squares with occurrence of both species are marked by black rhomboids.

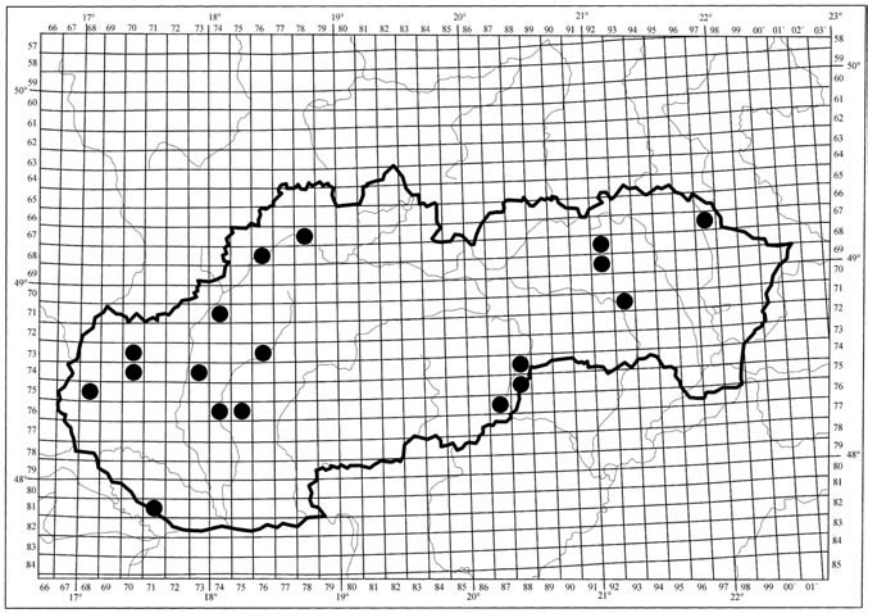

Fig. 9. Distribution of *Heterotoma merioptera* (Scopoli, 1763) in Slovakia.

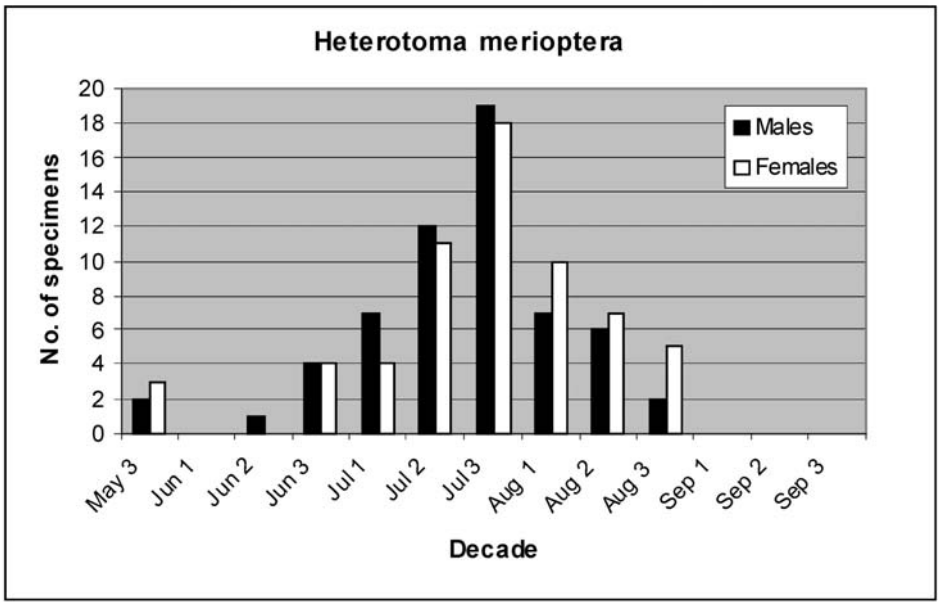

Fig. 10. Seasonal distribution of *Heterotoma merioptera* (Scopoli, 1763) in the Czech Republic and Slovakia. Individual captures are grouped into three decades of every month (i.e., May 3 = May 21–31, Jun 1 = June 1–10, Jun 2 = June 11–20, Jun 3 = June 21–30, etc.).

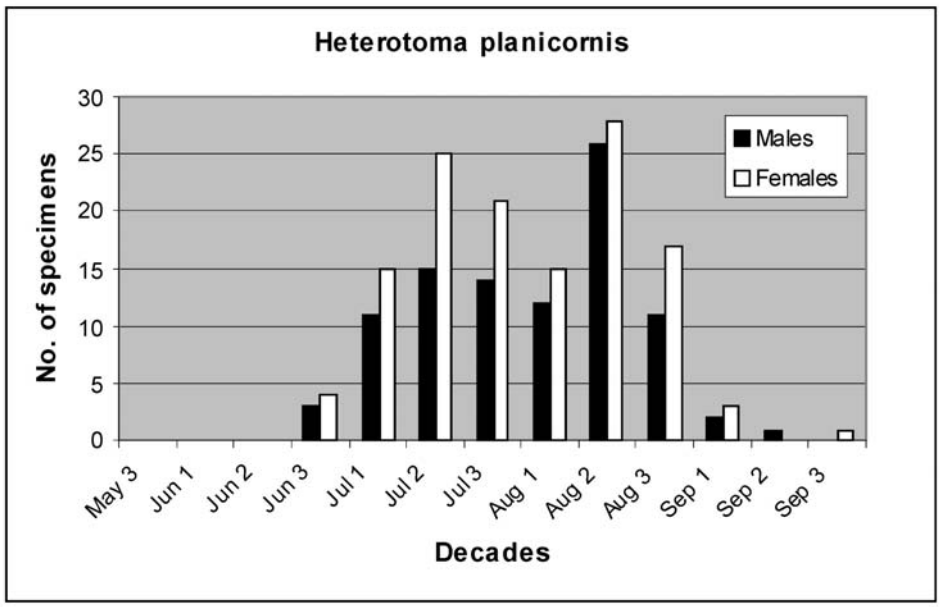

Fig. 11. Seasonal distribution of *Heterotoma planicornis* (Pallas, 1772) in the Czech Republic. Individual captures are grouped into the three decades of every month (i.e., May 3 = May 21–31, Jun 1 = June 1–10, Jun 2 = June 11–20, Jun 3 = June 21–30, etc.).

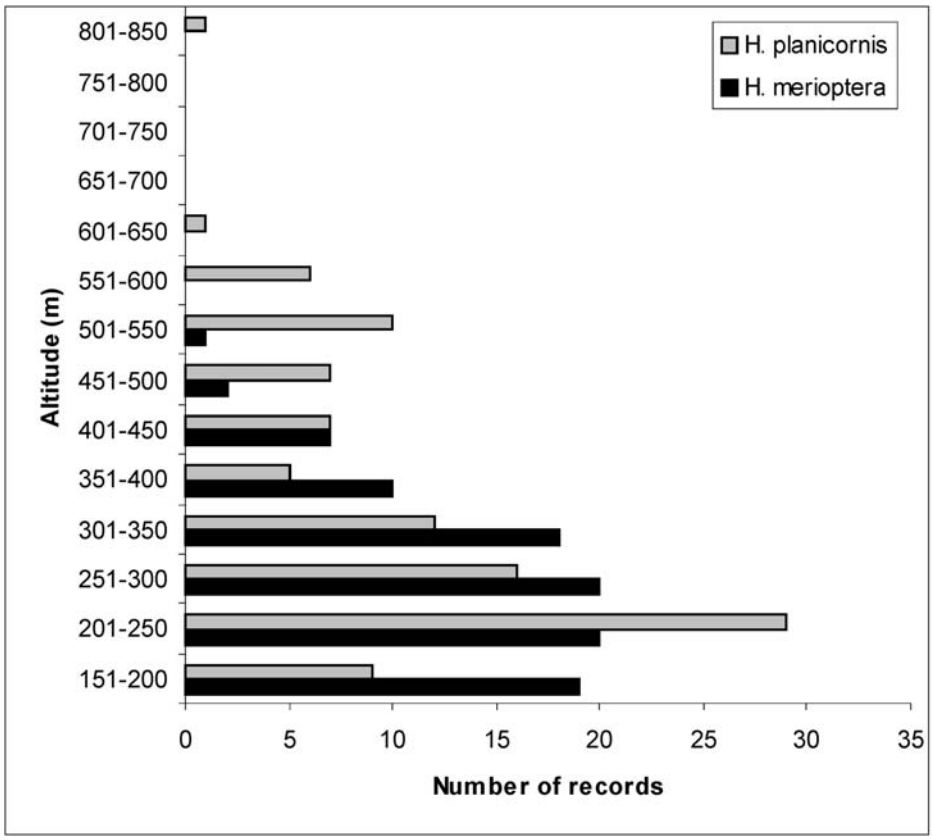

Fig. 12. Vertical distribution of *Heterotoma merioptera* (Scopoli, 1763) and *H. planicornis* (Pallas, 1772) in the Czech Republic.

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PLANT	AREA	REFERENCE
ACERACEAE		
Acer sp.	Bulgaria	JOSIFOV (1974a, 1974b)
Acer campestre L.	Slovenia	GOGALA & GOGALA (1986)
ANACARDIACEAE		
Pistacia terebinthus L.	Greece	LINNAVUORI (1999)
ASTERACEAE		
Eupatorium cannabinum L.	'Carniolia'	SCOPOLI (1763)
ELAEAGNACEAE		
Elaeagnus sp.	Turkey	LODOS *et al.* (2003)
ERICACEAE		
Rhododendron sp.	Turkey	LODOS *et al.* (2003)
FABACEAE		
Genista sp.	Turkey	LODOS *et al.* (2003)
FAGACEAE		
Quercus sp.	Bulgaria, Turkey	JOSIFOV (1974a), LODOS *et al.* (2003)
LAMIACEAE		
Origanum vulgare L.	'Carniolia'	SCOPOLI (1763)
Thymus sp.	Turkey	LODOS *et al.* (2003)
ROSACEAE s. l. (incl. Amygdalaceae, Malaceae)		
Cerasus avia (L.) Moench (= *Prunus avia* (L.) L.)	Czech Republic	this paper
Crataegus sp.	Bulgaria	JOSIFOV (1974b)
Malus domestica Borkh.	Croatia	BARIĆ & CIGLAR (2003)
Prunus sp.	Turkey	LODOS *et al.* (2003)
Pyrus communis L.	Croatia	BARIĆ & CIGLAR (2003)
Rosa sp.	Turkey	LODOS *et al.* (2003)
Rubus sp.	Turkey	LODOS *et al.* (2003)
SALICACEAE		
Salix sp.	Bulgaria	JOSIFOV (1974b)
ULMACEAE		
Ulmus sp.	Turkey	LODOS *et al.* (2003)
VITACEAE		
Vitis vinifera L.	Turkey	LODOS *et al.* (2003)

Tab. 3. Review of the plants mentioned in association with *Heterotoma merioptera* (Scopoli, 1763).

ANIMAL PREY	AREA	REFERENCE
ACARI	–	Fauvel (1999)
Panonychus ulmi (Koch, 1836)	France	Malevez (1976)
(= *Metatetranychus ulmi*)		Fauvel & Atger (1981)
(Tetranychidae)	Great Britain	Collyer (1953)
Bryobia rubrioculus (Scheuten, 1857)	France	Fauvel (1974)
(Tetranychidae)		Herard (1986)
STERNORRHYNCHA: APHIDOIDEA	Canada	Kelton (1982)
(eggs, larvae, adults)	France	Fauvel (1974)
		Herard (1986)
	Germany	Reichert (1919)
		Singer (1952)
		Kott (1993)
	Great Britain	Collyer (1953)
		Southwood & Leston (1959)
	Poland	Strawiński (1964b)
	Sweden	Kullenberg (1946)
	–	Fauvel (1999)
Myzocallis coryli (Goeze, 1778)	USA: Oregon	Messing & Ali Niazee
(Callaphididae)		(1985, 1986)
STERNORRHYNCHA: PSYLLOIDEA	–	Fauvel (1999)
Cacopsylla pyri (Linnaeus, 1758) (Psyllidae)	France	Herard (1985, 1986)
		Fauvel & Atger (1981)
Cacopsylla peregrina (Förster, 1848) (Psyllidae)	France	Herard (1986)
Cacopsylla crataegi (Schrank, 1801) (Psyllidae)	France	Herard (1986)
Trioza urticae (Linnaeus, 1758) (Triozidae)	France	Herard (1986)
HETEROPTERA		
Orthotylus spp. (living on *Cytisus scoparia*) (Miridae)	Great Britain	Dempster (1966)
Elasmucha ferrugata (Fabricius, 1787) (eggs)	Poland	Strawiński (1964b)
(Acanthosomatidae)	(in captivity)	
COLEOPTERA		
Gonioctena olivacea (Forster, 1771) (Chrysomelidae)	Great Britain	Dempster (1960)
(= *Phytodecta olivacea*) (eggs, larvae)		
LEPIDOPTERA (eggs)	–	Kullenberg (1946)
Papilio machaon (Linnaeus, 1758) and	Great Britain	Merrifield (1906)
Papilio polyxenes asterias Stoll, 1782 (eggs)	(open-air	Butler (1923)
(Papilionidae)	butterfly house)	
Yponomeuta (= *Hyponomeuta*) (larvae)	Germany	Gulde (1921)
(Yponomeutidae)		
Tortricidae (larvae)	Germany	Gulde (1921)
		Singer (1952)
DIPTERA		
Dasyneura pyri (Bouché, 1847)	Germany	Reichert (1919)
(Cecidomyidae)		

Tab. 4. Review of the animal prey of *Heterotoma planicornis* (Pallas, 1772).

PLANT	AREA	REFERENCE
'CONIFERS'	Poland	STRAWIŃSKI (1964b)
CUPRESSACEAE		
Juniperus sp.	Sweden	COULIANOS (1983)
PINACEAE		
Pinus sp.	–	REUTER (1908)
ACERACEAE		
***Acer* sp.**	Germany	**GULDE (1921)**
Acer campestre L.	Germany	GÖLLNER-SCHEIDING (1992)
Acer platanoides L.	Poland	STRAWIŃSKI (1966)
Acera pseudoplatanus L.	Germany	SCHUSTER (1998)
ANACARDIACEAE		
Pistacia lentiscus L.	Italy	CARAPEZZA (1981)
	Spain	RIBES (1965)
ASTERACEAE s.l. (incl. Ambrosiaceae)		
Ambrosia sp.	USA: California	WHEELER & HENRY (1992)
Artemisia sp.	Poland	STRAWIŃSKI (1964b)
Artemisia absinthium L.	Germany	REICHERT (1919)
BETULACEAE		
Alnus sp.	Germany	SCHUMACHER (1912a, 1912b)
		BRÖRING (1991)
		HOFFMANN (1992)
Alnus glutinosa (L.) Gaertn.	Czech Republic	this paper
	Germany	FRANZ & WAGNER (1961)
BUDDLEJACEAE		
Buddleja davidii Franchet	Germany	KOTT (1993)
BUXACEAE		
Buxus sempervirens L.	Czech Republic	this paper
CAPRIFOLIACEAE		
Lonicera sp.	Austria	HEISS (1997)
Viburnum lantana L.	Germany	SCHUSTER (1993)
CHENOPODIACEAE		
Atriplex tatarica L.	Czech Republic	this paper
CORYLACEAE (incl. Carpinaceae)		
Carpinus betulus L.	Germany	GÖLLNER-SCHEIDING (1992)
Corylus avellana L.	Czech Republic	this paper
	Germany	GÖLLNER-SCHEIDING (1992)
	Spain	GOULA (1990)
		RIBES & GOULA (1995)
	USA: Oregon	MESSING & ALI NIAZEE (1985, 1986)
Corylus maxima Mill.	Czech Republic	this paper
	Canada	KELTON (1982)
ELAEAGNACEAE		
Eleagnus angustifolia L.	Czech Republic	this paper

PLANT	AREA	REFERENCE
ERICACEAE		
Arbutus unedo L	France	Coffin & Matocq (2004)
Calluna vulgaris (L.) Hull.	Poland	Strawiński (1964b, 1966)
Rhododendron sp.	USA: California	Wheeler & Henry (1992)
FABACEAE	France	Ehanno (1987)
Cytisus scoparius (L.) Link.	Canada: British Columbia	Downes (1957)
(= *Sarothamnus scoparius* L. (Koch))		Waloff (1966), Kelton (1982)
	Germany	Reichert (1919)
		Michalk (1938)
		Singer (1952)
		Göllner-Scheiding (1968, 1970), Schuster (1994)
	Great Britain	Dempster (1966)
		Memmott *et al.* (2000)
		Waloff & Southwood (1960), Waloff (1966)
	Poland	Lis (1989)
	Spain	Goula (1986, 1990)
		Ribes & Goula (1995)
FAGACEAE		
Fagus sylvatica L.	Spain	Ribes & Goula (1995)
Quercus sp.	Norway	Coulianos (1998)
	Poland	Strawiński (1974)
Quercus ilex L.	–	Goula (1990)
Quercus pubescens Willd.	Spain	Goula (1990)
GROSSULARIACEAE		
Ribes sp.	Germany	Abraham (1937)
	Sweden	Coulianos (1983)
Ribes nigrum L.	Czech Republic	this paper
MALVACEAE		
Malva sp.	Germany	Gulde (1921)
MORACEAE		
***Morus nigra* L.**	Netherlands	**van Dinther (1953)**
OLEACEAE		
Fraxinus spp.	Germany	Singer (1952)
		Göllner-Scheiding (1992)
Fraxinus excelsior L.	France	Ehanno (1960)
PASSIFLORACEAE		
Passiflora manicata (Juss.) Pers.	USA: Hawaii	Gagné (1983)
POACEAE	France	Ehanno (1960)
POLYGONACEAE		
Rumex acetosa L.	France	Ehanno (1960)
RANUNCULACEAE s. l. (incl. Helleboraceae)		
Clematis vitalba L.	Germany	Singer (1952)

PLANT	AREA	REFERENCE
RHAMNACEAE		
Frangula alnus Mill.	Germany	SCHUSTER (1998)
Rhamnus cathartica L.	Germany	SCHUSTER (1998)
ROSACEAE s. l. (incl. Amygdalaceae, Malaceae)	France	EHANNO (1987)
Crataegus sp.	France Germany	HERARD (1986) SCHUSTER (1986)
***Crataegus monogyna* Jacq.**	Great Britain	**POLLARD (1968)**
Cydonia oblonga (= *C. vulgaris* Pers.)	Turkey	LODOS *et al.* (2003)
***Malus domestica* Borkh.**	Canada: British Columbia	KELTON (1982)
	Croatia	BARIĆ & CIGLAR (2003)
	Czech Republic	KINKOROVÁ & KOCOUREK (2000)
	Denmark	RAVN & RASMUSSEN (1996)
	France	COUTURIER (1972) FAUVEL (1974) MALEVEZ (1976)
	Germany	ABRAHAM (1937) SCHUSTER (1990) ZELETZKI & RINNHOFER (1966)
	Great Britain	**COLLYER (1953)** MASSEE (1954) WOODROFFE (1956)
	Poland	KORCZ (1967)
	Sweden	KULLENBERG (1946)
	–	FAUVEL (1999)
Prunus domestica L.	Germany	SINGER (1952)
	Sweden	KULLENBERG (1946)
	Turkey	LODOS *et al.* (2003)
***Prunus spinosa* L.**	Czech Republic	NICKERL (1905)
	France	EHANNO (1960, 1987)
	Germany	**GULDE (1921)**, JORDAN (1940, 1963), SINGER (1952) FRANZ & WAGNER (1961) SÜHLO (1996)
	Poland	HERCZEK (1979: as *H. silesiaca* – partim)
***Pyrus communis* L.**	France	HERARD (1985, 1986) FAUVEL & ATGER (1981)
	Germany	**REICHERT (1919)**
	Poland	STRAWIŃSKI (1966)
	Sweden	KULLENBERG (1946)
	–	FAUVEL (1999)
Rosa sp.	Germany	REICHERT (1919)
	Turkey	LODOS *et al.* (2003)
Rosa canina L.	Germany	SCHUSTER (1971)
***Rubus* spp.**	Germany	GULDE (1921) FRANZ & WAGNER (1961)
	Ireland	**HALBERT (1935)**
***Rubus* sp. (cultivated raspberries)**	Scotland	**HILL (1952)**
Rubus fruticosus L.	France	EHANNO (1987)
	Sweden	KULLENBERG (1946)

PLANT	AREA	REFERENCE
Rubus idaeus L.	Canada: British Columbia, Nova Scotia	Kelton (1982)
	Sweden	Kullenberg (1946)
RUTACEAE		
Citrus sinensis (L.) Osbeck var. *clemenules*	Spain	Ribes *et al.* (2004a)
SALICACEAE		
Populus alba L.	Germany	Reichert (1919)
Populus nigra L.	Germany	Michalk (1938)
		Göllner-Scheiding (1992)
***Salix* sp.**	Bulgaria	Josifov (1993)
	Germany	Schumacher (1912b)
		Gulde (1921)
		Göllner-Scheiding (1974)
		Schuster (1998)
Salix alba L.	Germany	Mölleken & Topp (1997)
Salix caprea L.	Germany	Gulde (1921)
Salix repens L.	Germany	Schumacher (1912b)
SAMBUCACEAE		
Sambucus nigra L.	France	Ehanno (1987)
SCROPHULARIACEAE		
Verbascum sp.	Poland	Strawiński (1964b)
SOLANACEAE		
Lycium barbarum L.	Czech Republic	this paper
Solanum dulcamara L.	Italy	Tamanini (1982)
	–	Goula (1990)
***Solanum tuberosum* L.**	Germany	**Kott (1993)**
TAMARICACEAE		
Tamarix sp.	Czech Republic	this paper
ULMACEAE		
Ulmus minor Mill.	Czech Republic	this paper
(= *U. carpinifolia* Gled.)	Germany	Göllner-Scheiding (1992)
URTICACEAE		
Urtica sp.	Germany	Wagner (1937)
		Franz & Wagner (1961)
		Schuster (1998)
		Günther (2003)
	Great Britain	Butler (1923)
	Poland	Strawiński (1963, 1964b)
***Urtica dioica* L.**	France	Ehanno (1960)
		Herard (1986)
	Germany	**Singer (1952)**
	Great Britain	**Southwood & Scudder 1956)**
		Southwood & Leston (1959)
	Italy	Rizzotti Vlach (1994)
	Sweden	Kullenberg (1946)
		Coulianos (1983, 1998)

PLANT	AREA	REFERENCE
VACCINIACEAE		
Vaccinium myrtillus L.	Poland	STRAWIŃSKI (1962, 1964a, 1964b, 1966, 1974)

Tab. 5. Review of the plants mentioned in association with *Heterotoma planicornis* (Pallas, 1772). Plants and papers with recorded occurrence of larvae are marked in **bold**. Data from REUTER (1883), ROUBAL (1957, 1959, 1961, 1963, 1967), and other authors that may concern both *H. merioptera* (Scopoli, 1763) and *H. planicornis* are omitted.