

The distribution of *Tropidothorax leucopterus* in the Czech Republic and Slovakia (Hemiptera: Heteroptera: Lygaeidae)

PETR KMENT¹, PAVEL ŠTYS², ALICE EXNEROVÁ², PAVEL TOMŠÍK³,
PETR BAŇAŘ^{4,5} & KAREL HRADIL⁶

¹Department of Entomology, National Museum, Kunratice 1, CZ-148 00 Praha 4, Czech Republic;
e-mail: sigara@post.cz

²Charles University, Prague, Faculty of Science, Department of Zoology, Viničná 7, CZ-128 44 Praha 2,
Czech Republic

³Charles University, Prague, Faculty of Medicine, Hradec Králové, Department of Biochemistry,
Šimkova 870, CZ-500 01 Hradec Králové, Czech Republic; e-mail: tomsikp@jfk.cuni.cz

⁴Department of Entomology, Moravian Museum, Hvězdoslavova 29a, CZ-627 00 Brno-Slatina,
Czech Republic; e-mail: petrbanar@seznam.cz

⁵Forestry and Game Management Research Institute, Department of Forest Protection, Strnady 136,
CZ-252 02 Jíloviště, Czech Republic

⁶State Phytosanitary Administration, Tyllova 29, Jičín, CZ-506 01, Czech Republic;
e-mail: Khradil@seznam.cz

KMENT P., ŠTYS P., EXNEROVÁ A., TOMŠÍK P., BAŇAŘ P. & HRADIL K. 2009: The distribution of *Tropidothorax leucopterus* in the Czech Republic and Slovakia (Hemiptera: Heteroptera: Lygaeidae). *Acta Musei Moraviae, Scientiae biologicae* (Brno) **94:** 27–42. – The past and recent occurrence of *Tropidothorax leucopterus* (Goeze, 1778) (Lygaeidae: Lygaeinae) in the Czech Republic and Slovakia is analysed, and the biology and ecology of the species are reviewed. It is recorded for the first time from Bohemia, which testifies to its current northward spread in Central Europe.

Keywords. Heteroptera, Lygaeidae, *Tropidothorax leucopterus*, Bohemia, Moravia, Czech Republic, Slovakia, Greece, biology, ecology, range expansion

Introduction

Tropidothorax leucopterus (Goeze, 1778) is a conspicuous aposematically-coloured (red-and-black) true bug (Figs 3, 4) trophically bound to plants of the family Apocynaceae s. lat. (including Asclepiadaceae) (PÉRICART 1999, WACHMANN *et al.* 2007; ENDRESS & BRUYNS 2000). It is widely distributed in southern, Central and Eastern Europe (Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, France, Germany, Greece, Hungary, Italy, Liechtenstein, Macedonia, Moldavia, Poland, Portugal, Romania, southern and central European Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine), North Africa (Algeria, Egypt), and Asia from the Near East to northern India (Azerbaijan, Afghanistan, Armenia, Georgia, India, Iran, Iraq, Kazakhstan, Kyrgyzstan, Tadzhikistan, Turkey, Turkmenistan, and Uzbekistan) (PÉRICART 2001; PROTIĆ 2001, KONDOROSY *et al.* 2006). HAMID & MEHER

(1976) expected this species from Pakistan, but they were unable to find a reliable record from this country. The occurrence in Indonesia (PUTSHKOV 1969, without exact locality) is most probably based on misidentification. In the Czech Republic the species was previously known only from southern Moravia (SPITZNER 1892, KMENT *et al.* 2003). In this paper we review all the records from the Czech Republic and Slovakia and discuss the possible current spread of the species in central Europe.

Review of the records

The records are arranged chronologically. Codes for the Central European mapping grid (EHRENDORFER & HAMANN 1965) follow PRUNER & MÍKA (1996) and NOVÁK (1989).

Bohemia (Fig. 1)

- Praha-Bohnice, Zámky Nature Monument (5852), along the boundary between flat steppe on top and steep, extremely xerothermic rocky part (porphyrite to diabase), end of August 2007, dozens of 5th instar larvae aggregated on *Vincetoxicum hirudinaria*, A. Exnerová and P. Štys lgt. & det., reared to adults by P. Baňař (coll. P. Štys, Prague) (see Fig. 5) (unpubl.)
- Praha-Bohnice, Zámky Nature Monument (5852), June 2008, dozens of larvae aggregated on *Vincetoxicum hirudinaria*, P. Fousová lgt., P. Štys det. (coll. P. Štys, Prague) (unpubl.)
- Lovčice, Kněžičky National Nature Reserve (former Bludy National Monument) (5858), southern steppe slopes, 2.vii.2008, 1 ♀, K. Hradil lgt. & det. (coll. K. Hradil, Miletín) (unpubl.)
- Chotovice, Kněžičky National Nature Reserve (Žehuňská obora deer park; Figs. 7–8) (5857–58; N 50°08'56", E 15°19'41", south-facing slopes, forest steppe, 6.x.2004, 10 spec. collected under bark of trees, M. Mikát lgt., P. Tomšík det. (coll. Museum of East Bohemia, Hradec Králové); 2.ix.2008, thousands of specimens (mostly adults, less frequently larvae) on *Vincetoxicum hirudinaria*, some adults also on flowers of other plants (*Tanacetum vulgare*, *Solidago* sp.), on bark of the trees (especially *Aesculus hippocastanum*) and on leaves of apple trees (on some lower leaves aggregating in groups sucking from the leaves), P. Tomšík & H. Ríhová observ. & det.; 7.ix.2008, 12 ♂♂ 16 ♀♀, P. Tomšík lgt. & det., P. Kment revid. (coll. National Museum, Prague) (unpubl.)
- Chotovice, at railway station (5857), 2.ix.2008, adults on flowers of *Tanacetum vulgare* (together with *Spiloselthus saxatilis*), P. Tomšík observ. & det. (see Fig. 4) (unpubl.)
- Žehuň, Žehuňský rybník pond National Nature Reserve (5857), meadow, 9.viii.2009, 1 specimen, J. Poříz photo, M. Fiala det., P. Kment revid. (<http://www.biolib.cz/cz/image/id81022>)
- Lovčice, Kněžičky National Nature Reserve (former Bludy National Monument) (5858), southern steppe slopes, 28.ix.2009, numerous specimens sitting on stairs and between logs of an old log cabin, P. Tomšík observ. (unpubl.)

Moravia (Fig. 1)

- Černowitz nächst Brünn (= Brno-Černovice; 6865), no date, Dr. Fleischer lgt. (SPITZNER 1892, as *Lygaeus familiaris*)
- Podyjí National Park, Čížov env., southern slopes of hills above River Dyje (above a former customs post) close to the bridge to Hardegg (Austria) (7161), June 1992, adults individually on isolated plants of *Vincetoxicum hirudinaria*, among dry grass in a light hornbeam-oak wood, P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)

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- Podyjí National Park, forest complex on southern slopes of hills south of Podmolí and Mašovice (7161), June 1992, hundreds of adults and late larvae found on stands of *Vincetoxicum hirundinaria* in dry, isolated and “hidden” glades in a mixed (predominantly oak, hornbeam and spruce) forest, P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Mikulov Svatý Kopeček Nature Reserve (7165), 29.v.1999, 1 ♀ on stand of *Vincetoxicum hirundinaria* in a meadow in a glade in predominantly *Quercus* wood, A. Exnerová and P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Hodonín (7168), north of the city, forest on sands, on *Vincetoxicum hirundinaria*, September 1999, a group of larvae and adults photographed by J. Klváček (V. Zeman, pers. comm.); 30.ix.2000, 1 ♀ 5 spec., V. Zeman lgt., P. Kment det. (coll. V. Zeman, Přerov & coll. P. Kment, National Museum, Prague) (KMENT et al. 2003)
- Rohatec (7169), 29.vi.2000, 1 ♂, no further data, M. Vodrážka lgt., P. Baňař det. (coll. Moravian Museum, Brno) (unpubl.)
- Sedlec (7266), Skalky Nature Reserve, limestone steppe slope, 240–250 m a.s.l., 1.viii.2000, 1 ♀, J. L. Stehlík lgt. & det. (KMENT et al. 2003)
- Radějov (7170), Lučina, sucking on *Tithymalus cyparissias*, 21.v.2001, 1 ♀, T. Baňař lgt., P. Baňař det. (KMENT et al. 2003)
- Bzenec-Přívoz (7069), on *Vincetoxicum hirundinaria*, 19.vi.2002, 1 ♂, P. Baňař lgt. & det. (KMENT et al. 2003); same locality, 28.vii.2005, V. Zeman lgt., 1 spec. (coll. V. Zeman, Přerov) (unpubl.)
- Klentnice, Tabulová hora National Nature Reserve (7165), dry meadow on southern slope of the limestone hill, end of August 2006, dozens of adults and 5th instar larvae aggregated on *Vincetoxicum hirundinaria*, photo by D. B. Řihová (Fig. 3), A. Exnerová and P. Štys det. (unpubl.)
- Klentnice, Tabulová hora National Nature Reserve (7165), dry meadow on southern slope of the limestone hill, beginning of June 2007, dozens of 4th and 5th instar larvae aggregated on *Vincetoxicum hirundinaria*, A. Exnerová, K. Svádová and P. Štys lgt. & det., reared to adults (coll. P. Štys, Prague) (Fig. 6) (unpubl.)
- Ječmeniště (7262), 10.vii.2007, photograph of two specimens on *Vincetoxicum hirundinaria* by V. Křivan (KMENT 2008)
- Horovany (7067–68), 19.vii.2008, 1 spec., K. Posolda photo & det., P. Kment revid. (<http://www.biolib.cz/cz/image/id81022/>) (unpubl.)
- Čejč, Bílý kopec Nature Monument, “Mansonova step” steppe (7067), 48°55'31"N, 16°58'47"E, 13.vii.2009, 1 ♀ swept from dry grassland, I. Malenovský lgt., P. Baňař det. (coll. Moravian Museum, Brno) (unpubl.)
- Radějov, 2 km W of Radějov village, “Žebrák” vineyard (7169), 15.viii.2009, 1 ♂ on *Asclepias syriaca*, T. Baňař lgt. & det., P. Baňař revid. (coll. Moravian Museum, Brno) (unpubl.)
- Radějov, ca. 3 km W of Radějov village, “Horní hory” vineyard (7169), 17.viii.2009, 1 spec., T. Baňař observ. & det. (unpubl.)
- Čejč, Bílý kopec Nature Monument, “Mansonova step” steppe (7067), 48°55'31"N, 16°58'47"E; 24.viii.2009, several hundred specimens aggregated on *Asclepias syriaca* in dry grassland, P. Baňař lgt. & det. (5 ♂♂ 3 ♀♀ in coll. Moravian Museum, Brno; 5 ♂♂ 2 ♀♀ in coll. National Museum, Prague) (unpubl.)
- Čejč, Bílý kopec Nature Monument, “Mansonova step” steppe (7067), 48°55'38"N, 16°58'32"E, 24.viii.2009, several hundred specimens aggregated on *Asclepias syriaca* in an abandoned orchard, P. Baňař lgt. & det. (8 ♂♂ 5 ♀♀ in coll. Moravian Museum, Brno; 7 ♂♂ 5 ♀♀ in coll. National Museum, Prague) (unpubl.)
- Kravsko (7061), Les Kravsko forest, 4.x.2009, 1 specimen, V. Vaníček photo & det., P. Kment revid. (<http://www.biolib.cz/cz/imageuser/id2189>)

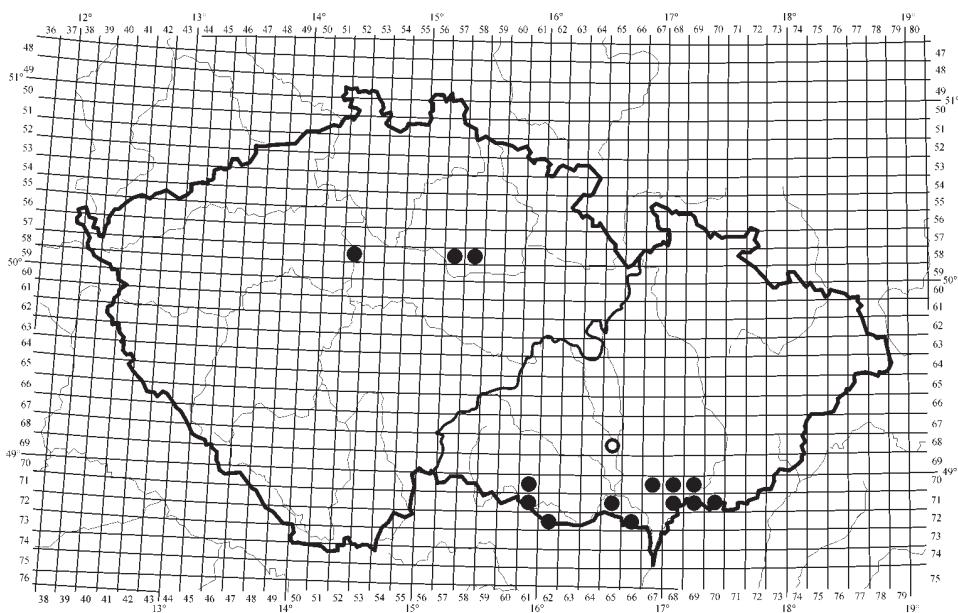


Fig. 1. The past (before 1900; open circle) and current distribution (from 1992; solid circles) of *Tropidothorax leucopterus* (Goeze, 1778) in the Czech Republic.

Slovakia (Fig. 2)

- Szepes-Olaszi (= Spišské Vlachy; 7090) (HORVÁTH 1897)
- Szádellő (= Zádiel; 7390) (HORVÁTH 1897). The species was never collected there during frequent visits in 1960s and 1970s (P. Štys, pers. observ.)
- Spišské Podhradie env., Dreveník (7090), 580–600 m a.s.l., no date, larger number of specimens, M. Součková lgt. (STEHLÍK 1955); Spišské Podhradie env., Dreveník, 600 m a.s.l., no date, 6 ♂♂ 5 ♀♀, M. Součková lgt. (STEHLÍK & VAVŘÍNOVÁ 1996)
- Spišské Podhradie env., Dreveník, 600 m a.s.l., no date, 3 ♂♂, M. Součková lgt., L. Hoberlandt det. (coll. National Museum, Prague) (unpubl.)
- Spišské Podhradie, Dreveník, limestone hill, 600 m a.s.l., 11.vi.1971, 1 ♂ 5 ♀♀ (1 ♂ 1 ♀ in copula), J. L. Stehlík lgt. (STEHLÍK & VAVŘÍNOVÁ 1996)
- Mužla-Čenkov, Čenkovská lesostep National Nature Reserve (8277), 8.vi.1972, thousands of adults aggregated on an extensive stand of *Vincetoxicum hirundinaria* in a large glade and among isolated trees (*Populus tremula*, *P. alba*) on sands in regularly inundated forest, P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Mužla-Čenkov, Čenkovská lesostep National Nature Reserve (8277), 18.vi.1974, over a hundred adults on the same site, as in June 1972, P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)

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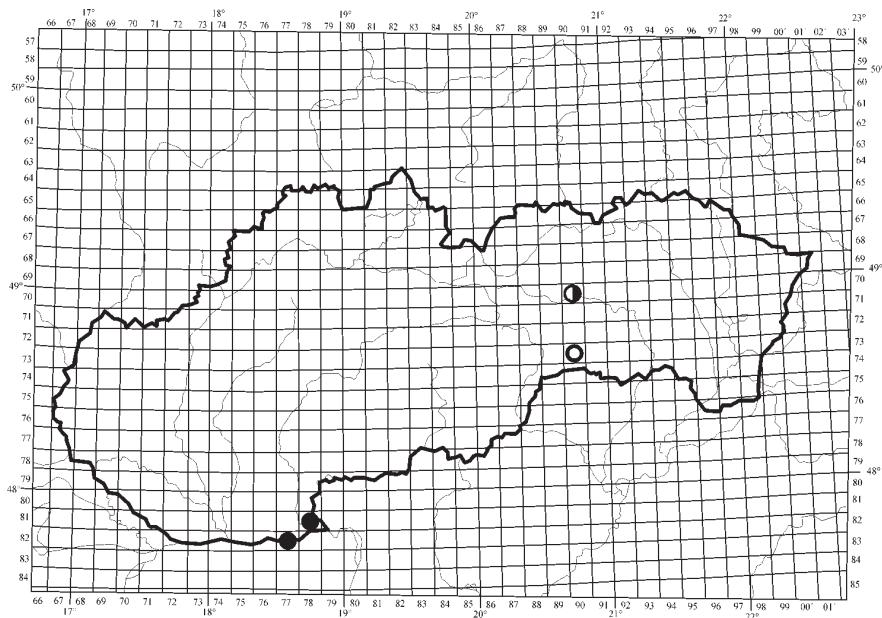


Fig. 2. The past (before 1900; open circles) and current distribution (from 2000; solid circles) of *Tropidothorax leucopterus* (Goeze, 1778) in Slovakia. The half-full circle refers to continuous occurrence of the species in the Spiš region (1890's–2007).

- Mužla-Čenkov, Čenkovská lesostep National Nature Reserve (8277), 18.vii.1983, 2♂♂ 2♀♀ along major forest road on *Vincetoxicum hirundinaria*, P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Štúrovo (8178), embankment of Hron river, 10.ix.2000, 1♂, M. Mantič lgt., P. Kment det. (KMENT et al. 2003)
- Mužla-Čenkov, Čenkovská lesostep National Nature Reserve (8277), end of September 2001, 2♂♂ 5♀♀ on small stands of *Vincetoxicum hirundinaria* along a sunlit major dirt road in the forest, A. Exnerová and P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Mužla, Čenkovská lesostep National Nature Reserve (8277), beginning of June 2003, about a dozen specimens on small stands of *Vincetoxicum hirundinaria* in a small glade among understorey stands of *Crataegus* spp., A. Exnerová and P. Štys lgt. & det. (coll. P. Štys, Prague) (unpubl.)
- Spišské Podhradie env., W slope of Spišský hrad (69–7090), N49°00.1' E20°45.3–4', 450–600 m a.s.l., dry steppe with travertine subsoil, individually on flowering vegetation along tourist path, 16.viii.2007, 1♂ 3♀♀ (all specimens newly hatched), J. Růžička lgt., P. Kment det. (coll. National Museum, Prague & coll. J. Růžička, Prague)

Discussion

Biology. The biology of *Tropidothorax leucopterus* in Ukrainian conditions was described in detail by PUTSHKOV (1969), translated as follows from the Ukrainian; other authors have later contributed only little to the matter. This species hibernates in the adult stage, usually aggregating beneath the loose bark of tree stumps and trunks as well as in other shelters. In spring, the bugs linger in groups in sunlit places and later, once the temperature rises, disperse successively, not very far from their overwintering sites. During the spring period, the bugs occur individually or in small groups (2–5 specimens) and feed on the tops of various grasses and semi-shrubs. In spring and at the beginning of summer, overwintering adults only rarely occur in the biotopes with their host plants (PUTSHKOV 1969).

From the middle or end of May (Crimea, Kiev Region) overwintering adults copulate and concentrate near their host plants. The females start to lay eggs shortly after copulation, at the end of May or the beginning of June. All the eggs are laid at once, 40–60 in one clutch, deposited under rotten leaves, moss, etc. Soon afterwards, the females die. The development of eggs takes c. 20 days. Shortly after hatching, the larvae stay in close groups on their eggshells (PUTSHKOV 1969), where they acquire their endosymbionts (WACHMANN *et al.* 2007). The first ecdysis takes place on the empty eggshells, and then the entire group of larvae moves to the nearest host plant. In spite of all the colony coming from a single clutch, their development is always asynchronous. For example, the first young adults co-occurred with numerous larvae of instars IV–V as well as several larvae of instar III and sometimes even instar II in the environs of Bilogors'ka (Crimea) at the beginning of July. Similar observations were also made in August in the environs of Kiev (Holesievo) (PUTSHKOV 1969). The first young adults usually start to appear in the forest-steppe zone of Ukraine in the second half of June, but even in the mid-August it is still common to find larval instars IV–V there. Young adults also appeared at the same time in large numbers in the foothills of the Western Caucasus (Maykop). The final larvae finish their development at the end of August or the beginning of September, then the adults leave the host plants (PUTSHKOV 1969). In Central Europe, WACHMANN *et al.* (2007) mentioned first adults of the new generation in July.

Host plants. *Tropidothorax leucopterus* develops mostly on plants of the subfamily Asclepiadoidea (Apocynaceae): *Vincetoxicum hirundinaria* (e.g. PUTON 1878, STOBIECKI 1915, FRANZ & WAGNER 1961, PUTSHKOV 1969, STEHLÍK & VAVŘÍNOVÁ 1996, PÉRICART 1999, RIEGER 2000, WACHMANN *et al.* 2007), *V. scandens*, *V. stepposum* (PUTSHKOV 1969), *Asclepias syriaca* (= *A. cornuti*) (PUTSHKOV 1969, WACHMANN *et al.* 2007), and *Cynanchum acutum* (PUTSHKOV 1969). In western and Central Europe it largely prefers the native *Vincetoxicum hirundinaria* (e.g. FRANZ & WAGNER 1961, PÉRICART 1999, STEHLÍK & VAVŘÍNOVÁ 1996, RIEGER 2000, WACHMANN *et al.* 2007, this paper) but it also feeds on the alien *Asclepias syriaca* (e.g. GÜNTHER 2007, WACHMANN *et al.* 2007, this paper). We can also confirm its development on the vine *Cynanchum acutum*, on which they occur in enormous aggregations in coastal semi-ruderal and urban situations in the eastern Mediterranean (Greece: Thassos Island: Skala Prinos and Limenas, repeated observation over several recent years, early summer to early autumn, both larvae and

adults, A. Exnerová and P. Štys). Apart from the Apocynaceae, large populations of this bug develop on *Clematis recta* (Ranunculaceae) in Ukrainian forest-steppe zone conditions (PUTCHKOV 1969). In spring and late summer the adults feed on the top parts of various herbs, shrubs, and low trees such as *Salvia glutinosa* (Lamiaceae) (FRANZ & WAGNER 1961), *Rosmarinus officinalis* (Lamiaceae) (PUTCHKOV 1969), *Lavandula stoechas* (Lamiaceae) (COSATS & VÁZQUEZ 2004), *Gentiana asclepiadea* (Gentianaceae) (FRANZ & WAGNER 1961), several species of Asteraceae – *Eupatorium cannabinum* (Soós 1973), *Helichrysum arenarium* (GÜNTHER 2007), *Solidago canadensis* (GÜNTHER 2007, this paper), *Tanacetum vulgare* (this paper), and *Malus domestica* (Rosaceae) (this paper), but it very probably does not develop on them (cf. PUTSHKOV 1969, PÉRICART 1999).

Both adults and larvae of *T. leucopterus* prefer to suck on vegetative parts (leaves, stems) and, unlike other Lygaeinae (especially *Lygaeus* and *Spilostethus*), they suck only exceptionally on seeds (PUTSHKOV 1969, PÉRICART 1999, WACHMANN *et al.* 2007). When a big colony feeds on a stem, the apical part of the plant fades and dies quickly, and the bugs move to another plant. They suck rather rarely on leaf blades; however, in such cases they leave traces in the form of small, pale spots in places where they pierced them (PUTSHKOV 1969). Such whitish, spot-like necroses on the vegetative parts of *Vincetoxicum hirundinaria* are shown from the localities of Zámky (Fig. 5) and Tabulová hora (Fig. 6) (also WACHMANN *et al.* 2007).

Ecology. PUTSHKOV (1969) considered *Tropidothorax leucopterus* a mesophilous species in the Ukraine, inhabiting glades and forest outskirts, parks, the slopes of ravines overgrown with bushes, forest belts, banks of dikes, etc. In the forest-steppe zone of Ukraine it is fairly common in coppices, while in Crimea it occurs on the slopes of mountains overgrown with old beech, reaching the upper forest limit (PUTSHKOV 1969). In Central Europe it prefers warm and more or less open places (perhaps the further north, the greater the preference for sunny, open habitats) (WACHMANN *et al.* 2007; our observations). Here it often inhabits forest margins, margins of forest roads, glades and clearings, where the host *Vincetoxicum hirundinaria* often grows (e.g. FRANZ & WAGNER 1961, PÉRICART 1999, RIEGER 2000; our observations). However, it may also colonize river embankments and the roadside vegetation of highways (RIEGER 2000). In Tirol it occurs in warm localities at up to 1000 m a.s.l. (HEISS 1973).

Most of the Bohemian, Moravian and Slovak localities conform well to the general characteristics given above. The Kněžíčky locality is a deer-park intensively grazed by fallow deer and mouflon, so *V. hirundinaria* is the dominant plant in some patches (P. Tomšík, pers. observ.; Figs. 7–8). The sites of occurrence of *T. leucopterus* at Prague – Zámky, the second Bohemian locality, are situated along a boundary between flat steppe at the top and a steep, extremely xerothermic rocky part sloping towards the River Vltava; the geological substrate is a transition from porphyrite to diabase. In Moravia this species was collected in three main types of habitat: i) glades or sparse thermophilous forests growing on the south-facing slopes of the River Dyje valley (Podyjí National Park), on the limestone hills of Pálava (Svatý kopeček above Mikulov), and on sandy substrates (environs of Hodonín and Bzenec); ii) rocky and grassy steppes on limestone

hills or loess slopes (Tabulová hora, Skalky, Čejč); and iii) vineyards and orchards (Radějov, Čejč). All the Moravian localities are situated in the warmest Pannonian lowlands of south and south-eastern Moravia. The two Bohemian localities are also situated in the warmest areas of Bohemia, characterised by xerothermic plant associations (thermophyticum).

The southern Slovak locality, Čenkov (close to the River Danube), is nowadays an enormous secondary forest of *Robinia pseudoacacia* situated on entirely sandy ground and enclosing and mixing with relic (shifting) sand steppes memorable for the common occurrence of *Ephedra distachya* and a large sand “forest-steppe” in a relic *Populus alba*-*P. tremula* forest, often with *Crataegus* undergrowth, but also often with glades with grass, a variety of Chenopodiaceae and large stands of only *Vincetoxicum hirundinaria*. Significantly, we (Exnerová and Štys, unpubl.) have never found *T. leucopterus* there in open steppes, always along forest roads and in natural glades, and always on its host plant. The bug is definitely absent from the neighbouring open and xeric Čenkovské písky Sands locality, from the artificial clearings in Čenkov wood and forest, but was found in natural, semi-shaded glades of the Čenkovská lesostep forest-steppe situated nearby. In nearby Štúrovo the species was collected on the embankment of the Hron river (KMENT *et al.* 2003). The last northern Slovak localities with known long-term occurrence of *T. leucopterus* are Dreveník and Spišský hrad, two neighbouring limestone (travertine) hills with xerothermic steppe vegetation on their slopes. Unlike the other Czech and Slovak localities, this one is situated in only a moderately warm climatic region and reaches a highest altitude of *c.* 600 m a.s.l. (STEHLÍK & VAVŘÍNOVÁ 1996).

Distribution. According to PÉRICART (1999), the distribution range of *Tropidothorax leucopterus* should be classified as Turano-Ponto-Mediterranean. Its northern boundary crosses northern France (Pays de la Loire, Normandy, Paris region, Lorraine, Alsace), southern Belgium, southern Germany (Baden-Württemberg, Bavaria), Moravia, Slovakia, southern Poland (Kraków region) and European Russia towards *c.* 50°N (Kursk, Voronezh, Kuybyshev) (PÉRICART 1999).

In Germany, HOFFMANN & MELBER (2003) listed this species only from Bavaria, Baden-Württemberg, and Rhineland-Palatinate. The records from Bavaria were reviewed by SCHUSTER (2001) and BRÄU & SCHWIBINGER (2004). The first Bavarian records (e.g. Nürnberg, Regensburg) had already been given by KITTEL (1869, 1871). HÜTHER (1951) reported a mass occurrence on *Vincetoxicum hirundinaria* in Korbinianiwald at Oberschleißheim (see also BRÄU & SCHWIBINGER 2004). BRÄU & SCHWIBINGER (2004) presented further records from the Korbinianiwald and certain other localities in the northern environs of Munich (mapping grid squares 7734, 7735, 7635 according to EHRENDORFER & HAMANN 1965) from the years 1950–1953, 1976, 1992, 1996–2001, documenting the possible continuous occurrence of the species in this area. In Baden-Württemberg, *T. leucopterus* has been known for a long time from the area of Kaiserstuhl (WAGNER 1966, VOIGT 1970, RIEGER 2000, NICKEL *et al.* 2003). However, in the mid-1980s, it started to spread northwards along the Rhine valley, with a northernmost limit at Sondernheim (N 49°11') (RIEGER 2000). However, GÜNTHER (2007) reported its mass

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occurrence on neophyte *Asclepias syriaca* in Mainzer Sand (*c.* N 50°00') about 90 km north of Sonderheim in September 2006. RENKER (2007) found another mass occurrence in Koppelstein-Helimestal reserve south of Lahnstein (*c.* N 50°18') about 120 km north of Senderheim in May 2007. GÜNTHER (2007) also added the first records from Hesse, both situated in the Rhine area (Darmstadt-Eberstadt, 2004; Kühkopf at Stockstadt, 2006). Based on these records, RIETSCHEL (2007) classified *T. leucopterus* as one of the species currently spreading in response to climate warming. The species is included in the Red List of the German Heteroptera in category A2/3 (strongly endangered or endangered) (GÜNTHER *et al.* 1998, HOFFMANN & MELBER 2003).

In Poland, there are only two old records, from the period 1885–1914, from the environs of Kraków-Przegorzały (September 19, numerous specimens in copula on limestone rocks on *Vincetoxicum officinale*) and Krzyszkojce (June 19, forest clearing) – published by STOBIECKI (1915) (D. Chłond, pers. comm.). CMOLUCHOWA & MIELEWCZYK (1990) listed *T. leucopterus* from Poland as a literary record only.

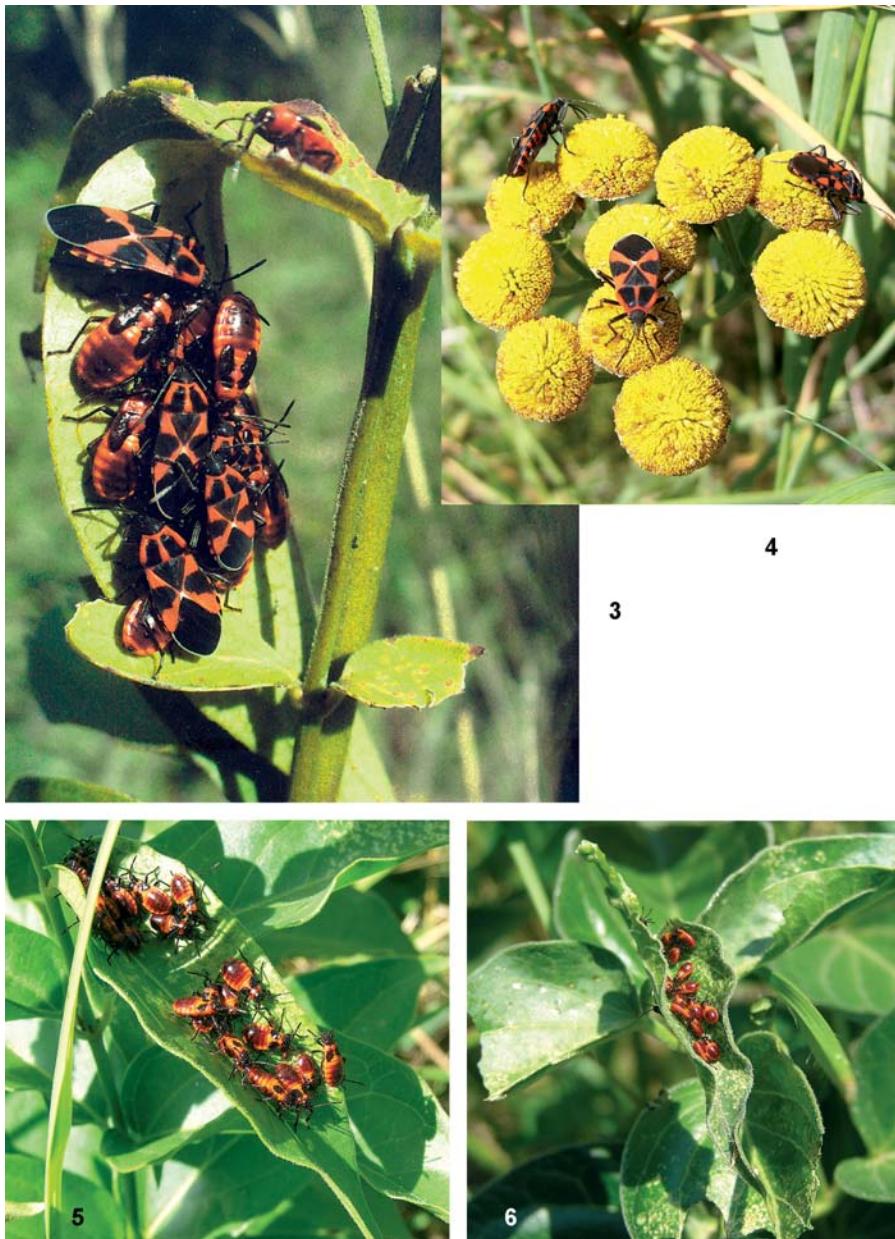
Further north, SPUNGIS (2003) also listed this species from Latvia, based on reference to SAARS (1931), who mentioned only two Lygaeinae species from Latvia – *Lygaeus equestris* and *T. leucopterus*. LUKASHUK (1997) did not excerpt the SAARS's (1931) paper in his checklist and this record thus remains doubtful. LUKASHUK (1997) also regarded previous records from Estonia (see PUTSHKOV 1969) as erroneous.

In Liechtenstein, BERNHARDT (1992) reported the species from warm localities in the non-Alpine region of the country. Later, he included *T. leucopterus* in the Red List of Liechtenstein Heteroptera as “in danger of extinction” (BERNHARDT 1995).

In Austria, *Tropidothorax leucopterus* is known in all the federated lands in warm places up to 1000 m a.s.l. (e.g. FRANZ & WAGNER 1961; HEISS 1973; MELBER *et al.* 1991; FRIESS 2001; RABITSCH 2002, 2003a,b, 2006; WACHMANN *et al.* 2007). RABITSCH (2007) did not include the species in the Red List of true bugs of Lower Austria.

In Hungary, the species is also distributed over the whole territory (HORVÁTH 1897, SOÓS 1973, KONDOROSY 2000, BÁKONYI *et al.* 2002, HARMAT *et al.* 2007). However, it is considered rare (HARMAT *et al.* 2007; D. Rédei, pers. comm.).

Despite the fact that *T. leucopterus* was long ago first recorded from Slovakia by HORVÁTH (1897), it is known from only three regions – Zádiel in the Slovak Karst (south of central Slovakia; HORVÁTH 1897), the environs of Mužla and Štúrovo (southernmost Slovakia; KMÉNT *et al.* 2003, this paper), and the Spiš region (north of central Slovakia). The record from Zádiel has never been confirmed in the 20th century despite intensive collecting in this locality (J. L. Stehlík, P. Štys, etc.). On the other hand, we are sure of the continuous presence of *T. leucopterus* in the Čenkov area from the 1970's until recently. This is actually a complex sandy area situated in a vicinity containing a number of thermophilous xeric, mesophilous and hygrophilous habitats and formerly very dynamic owing to frequent inundations by Danube floods. The first record from Spiš (Spišské Vlachy; HORVÁTH 1897) dates back to the 19th century. In the 1950's and in 1971 it was found on Dreveník Hill near Spišské Podhradie (STEHLIK 1955, STEHLÍK & VAVŘÍNOVÁ 1996) and recently, in 2007, on the neighbouring hill of Spišský hrad Castle. These records, spread over more than a century, confirm the probable continuous



Figs 3–6. 3 – Adults and larvae of *Tropidothorax leucopterus* (Goeze, 1778) feeding on *Vincetoxicum hirundinaria* (Klentnice env., Tabulová hora NNR, August 2006). Photo D. B. Říhová. 4 – An adult of *T. leucopterus* (in the middle) and two adults of *Spilostethus saxatilis* (Scopoli, 1763) on an inflorescence of *Tanacetum vulgare* (Chot'ovice, at the railway station, 2.ix.2008). Photo P. Tomšík. 5 – Larvae (instar 5) of *T. leucopterus* feeding on *V. hirundinaria* (Praha, Zámky NM, end of August 2007). 6 – Larvae (instars 4–5) of *T. leucopterus* feeding on *V. hirudinaria* (Klentnice env., Tabulová hora NNR, beginning of June 2007). Figs 5–6: Photo A. Exnerová.

Tropidothorax leucopterus in the Czech Republic and Slovakia



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Figs 7–8. Habitat of *Tropidothorax leucopterus* (Goeze, 1778) in Kněžičky National Nature Reserve (Chotovice env.). Photo P. Tomšík.

distribution of *T. leucopterus* in this area. It is probable that such refugia near the northern boundary (Čenkov, Spiš, environs of Munich, Kaiserstuhl) play an important role as sources of specimens for further spreading during favourable climatic conditions. STEHLÍK & VAVŘÍNOVÁ (1996) also mentioned one more Slovak record from Mníšek nad Hnilcom with reference to SZILÁDY (1908). However, this is a misinterpretation of the locality "Remetei szoros", which refers to Cheile Remetului in Romania and not to Remete, which is the former Hungarian name of Mníšok pod Hnilcom (KOLEKTIV 1977). ŠTEPANOVIČOVÁ & BIANCHI (2001) did not include this species in the Red List of Slovak Heteroptera.

In the Czech Republic, *T. leucopterus* was known until recently from only a single record from Brno dating back to 1890's (SPITZNER 1892) and was considered extinct by STEHLÍK & VAVŘÍNOVÁ (1997). However, since 1992 this species has been rediscovered in several localities in southern Moravia (KMENT *et al.* 2003, KMENT 2008, this paper). As some of these localities were sampled intensively from the 1940's (Pálava region, Čejč, environs of Bzenec) or even earlier (Prague), we can be quite sure this conspicuous species did not occur there in previous decades. The sudden re-appearance of *T. leucopterus* in southern Moravia seems to be the result of a recent northward shift in its distribution range due to the favourable climatic conditions of the past two decades, a trend also recorded in the Rhine valley in Germany (RIEGER 2000, GÜNTHER 2007, RIETSCHEL 2007). From this point of view, *T. leucopterus* is not exceptional in the Czech heteropteran fauna. During the past two decades, several thermophilous species assumed extinct in the Czech Republic have reappeared (*Peirates hybridus* (Scopoli, 1763) – KMENT & BRYJA (2001); *Tingis auriculata* (A. Costa, 1847) – STEHLÍK (2002); *Stephanitis pyri* (Fabricius, 1775) – KMENT & VAHALA (2006); *Megalotomus junceus* (Scopoli, 1763) – HRADIL *et al.* (2008)). Other species, previously not recorded in our fauna, have been discovered as new in the same period and have sometimes started to spread (e.g. *Sciocoris sulcatus* Fieber, 1851 – STEHLÍK (1995); *Thyreocoris fulvipennis* (Dallas, 1851) – STEHLÍK (1998); *Oxycarenus lavaterae* (Fabricius, 1787) – KMENT *et al.* (2006); *Agramma atricapillum* (Spinola, 1837) – BALVÍN (2007); *Corixa panzeri* Fieber, 1848 – STRAKA *et al.* (2009)). Finally, certain other previously rare species, once confined to southernmost Moravia, are currently spreading north- and westwards, some of them even reaching Bohemia (e.g. *Oxycarenus pallens* (Herrich-Schaeffer, 1850) (STEHLIK & VAVŘÍNOVÁ 1997, KRIST & KMENT 2006, MÁCA 2006); *Liorhyssus hyalinus* (Fabricius, 1794) (RUS 2005; HRADIL *et al.* 2007, 2008)). The very same pattern of spread as in *T. leucopterus* was also recently observed in the praying mantis (*Mantis religiosa* Linnaeus, 1758), with both the species occurring together in the Kněžičky locality (JANŠTA *et al.* 2008; P. Tomšík, pers. observ.). This spread of thermophilous species in neighbouring Austria has also been analyzed in detail by RABITSCH (2008). KMENT & VILÍMOVÁ (2006) included *Tropidothorax leucopterus* as a critically endangered species in the Red List of Czech Heteroptera. However, its further spread will probably result in a reduction of its status in the future.

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