

On the distribution and ecology of the ant cricket (*Myrmecophilus acervorum*) (Orthoptera: Myrmecophilidae) in Slovakia

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Abstract: The ant cricket (*Myrmecophilus acervorum* Panzer, 1799) ranks among little-known species of the European orthopterans. It occurs almost throughout Europe with the exception of the cold regions of the north. This genus is unique among orthopterans. These include the smallest species of this order clearly adapted to life associated with ants. This article provides information about the distribution and ecology of the ant cricket in Slovakia. The result of our research is 103 records from 69 mapping squares. Records refer to the altitudes from 105 to 960 m. We have found that regularly occurs mainly in the warmer regions of Slovakia, nevertheless it is usually found only singularly. We confirmed the occurrence in ant colonies of *Lasius*, *Formica* (merely *F. fusca*), *Myrmica* and *Tetramorium caespitum* (only once). Regarding the type of symbiosis, it is a synoecious myrmecophile with certain features of symphily. Nevertheless, it seems to be that is not strictly bound to the ants. This is confirmed by specimens caught under stones away from ants or in pitfall traps (more than 60 % of records); obviously these are cases of active migration. The ant cricket had been formerly considered to be a rare species; recently it seems to be quite frequent. The taxonomic situation in this genus, especially in southern Europe, is unclear – it occurs here about 8 other species, hardly distinguishable. Therefore, extensive research of distribution, ecology and taxonomy of ant crickets is necessary.

Introduction

The ant cricket had been formerly considered to be a rare species (Roubal 1905, Dobšík 1959). Actually, the main reasons were its tiny dimensions and hidden way of life. Newer research, especially during the last two decades proves that it occurs almost in the whole territory of Slovakia, except the high mountains. Nevertheless, it is usually found singularly or a few specimens only. It appears in a wide scale of habitats, including anthropogenous ones. Recent observations may lead to the conclusion that it should not be ranked among rare species. Despite these facts this species

deserves further detailed investigation. Its ecology and relations to the host ants are not known in detail and, moreover, taxonomic situation in this genus, especially in southern Europe, is unclear. About 8 other species are found here, hardly distinguishable from each other.

Material and methods

Commonly used bulk sampling methods (sifting of detritus) are mostly ineffective in the case of *Myrmecophilus acervorum*; and this is one reason why it has been observed so sporadically and rarely. Therefore, it is necessary to use individual sampling methods. We used individual optical investigation of the surface of the soil, especially under stones with ants, as well as under the bark of older trees. Ant crickets were occasionally observed and collected together with other myrmecophilous insects (details are given below). We also used the method of pitfall traps that was despite negative expectations very successful. The material was prepared partially in a dry way, the rest stored in alcohol. Voucher material is deposited in collections of authors; findings of O. Majzlan are especially deposited in the Museum of Nature Protection and Speleology, Liptovský Mikuláš.

Results and discussion

Genus *Myrmecophilus* is unique among orthopterans. They are one of the smallest species of this order (± 3 mm), apparently altered due to the way of life. Conspicuous morphologic adaptations include lacking of wings and stridulatory organs, pale pigmentation of soft cuticle and almost complete reduction of eyes. In Central Europe only females are found, this species reproduces asexually, by thelytokous parthenogenesis. In southern Europe males appear only sporadically. However, these probably represent different species of this genus: Nine species of ant crickets are mentioned in Europe (Heller 2013) including *Myrmecophilus acervorum* of course, which reaches most northerly. Difficulties in assessing the distribution and ecology of ant crickets may arise in particular because the species of this genus are quite difficult to distinguish.

Survey of records in chronologic order (if the source allowed it) is available in the following text. The map of its distribution in Slovakia (according to the Databank of Slovak Fauna – DSF) is enclosed below (fig. 1).

Zádiel village (7390d/7391c), ± 310 m a. s. l. (later only „m“), June 1956, Húrka lgt. (Čejchan 1959).

Vinné village (7197d), ± 220 m, forest steppe, under the stone together with *Lasius* sp. 1961 (Gulička 1967).

Stupava town – Obora, (7768a), 250 m, May 1971, the mown meadow, in the colony of *Lasius* sp. together with *Atelura formicaria* Heyden, 1855, several ♀♀ (Majzlan 2009).

Nature Reserve (later only „NR“) Devínska Kobyla (7867b/7868a), ± 300 m, forest steppe, 1972 (Gulička 1974).

Pezinok town – Cajla, (7669c/d), 380 m, June 1972, forest edge, in the pitfall trap, 1 ♀ (Majzlan 2009).

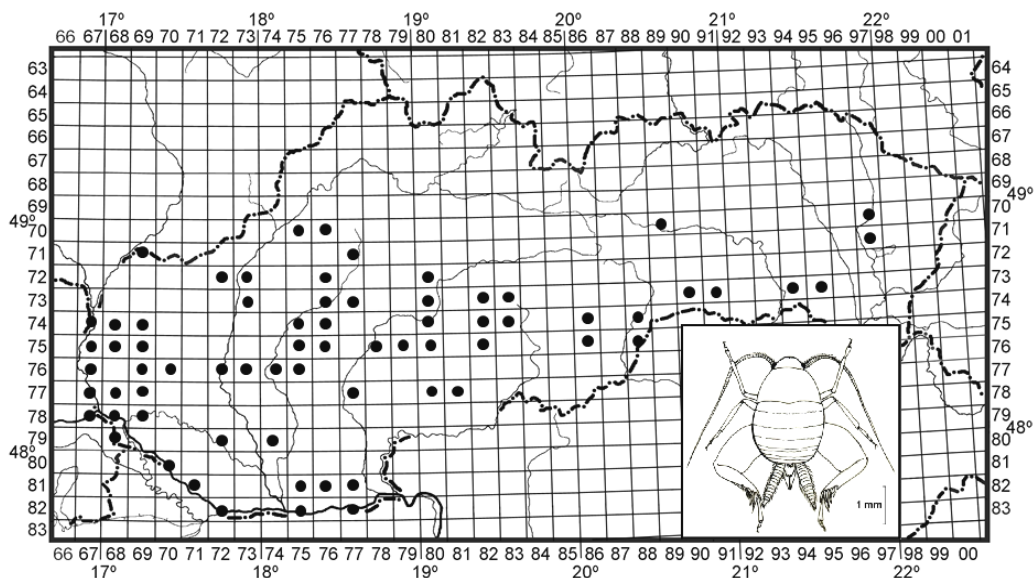


Fig. 1. Distribution of *Myrmecophilus acervorum* in the DSF mapping squares

Vinosady village, (7669d), 260 m, June 1972, rocky steppe, in the pitfall trap, 1 ♀ (Majzlan 2009).

Zádiel village (7390d/7391c), ± 310 m, forest steppe, 1974 (Chládek 1994).

Kátov village (7169c), 161 m, June 13, 1975, on the bank of the Chvojnica brook, under the stone, 1 ♀ (Majzlan 2009).

Bratislava city – Vlčie Hrdlo (7868d), 120 m, July 1978, under the stone together with *Atelura formicaria* near the dike, 2 ♀♀ (Majzlan 2009).

Bratislava city – Petržalka: Ovsište (7868d), 120 m, June 1979, in the pitfall trap near the gravel bank, 2 ♀♀ (Majzlan 2009).

Pohranice village (near the Nitra town, 7675c), 330 m, July 12, 1979, xerothermic grassland, in the pitfall trap, 2 ♀♀ O. Majzlan leg.

Bratislava – NR Ostrov Kopáč (7968b), 135 m, xerothermic grassland, together with *Atelura formicaria* May 1980, 1 ♀ and June 27, 1982, 2 ♀♀ (Majzlan 2009).

Rohožník village (7569a), 220 m, May 1981, forest edge, in the pitfall trap, 1 ♀ (Majzlan 2009).

Čičov village (8272b), 110 m, June 1981, under the stone together with ants *Myrmica* sp. near the dike, 1 ♀ (Majzlan 2009).

Nitra town – Calvary (7674c/d), 280 m, June 1981, under the stone in the xerothermic grassland, 1 ♀ (Majzlan 2009).

NR Sokol near the Humenné town (7097c), 400 m, May 2, 1982, in the colony of *Lasius* sp. together with *Atelura formicaria* in the xerothermic grassland, 1 ♀ (Majzlan 2009).

The Brekov castle near the Humenné town (7097a), 300 m, May 18, 1982, xerothermic grassland, in the pitfall trap, 1 ♀ (Majzlan 2009).

Bratislava city – Vrakuňa: the Airport (7869b), 130 m, July 5, 1982, ruderal grassland, under the stone together with *Atelura formicaria*, 2 ♀♀ (Majzlan 2009).

NR Abrod near the Závod village (7467c), 150 m, June 16, 1983, sandy grassland, in the pitfall trap, several ♀♀ (Majzlan 2009).

Veľaty village (7495d), 180 m, May 25, 1984, edge of the oak forest, in the pitfall trap, 1 ♀ (Majzlan 2009).

Slanec village – near the castle (7394d), 430 m, July 5, 1984, open deciduous forest, under the stone together with ants *Lasius* sp. and *Atelura formicaria* (Majzlan 2009).

Hodruša village – Moltra (7578a), 610 m, July 13, 1984, in the pitfall trap, 1 ♀ (Majzlan 2009).

Čajkov village (7777b), 350 m, July 1984, edge of the oak forest, in the pitfall trap, 1 ♀ (Majzlan 2009).

NR Lindava near the Častá village, (7670a), 220 m, June 1985, edge of the oak forest, in the pitfall trap, 1 ♀ (Majzlan 2009).

Veľčice village – Veľčické cery (7575d), 250 m, June 21, 1985, xerothermic pasture, under the stone in the colony of *Lasius emarginatus*, several ♀♀ (Majzlan 2009).

Solčany village – Ukropová (7475c), 380 m, April 30, 1986, edge of the oak forest, in the pitfall trap, 1 ♀ (Majzlan 2009).

Štiavnické vrchy Mts – NR Holík (7579c), 600 m, May 15, 1985, rocky steppe, in the pitfall trap, 1 ♀ (Majzlan 2009).

Dunajský Klátov village (7972a/c), 130 m, July 1988, sheep pasture, under the stone in the colony of *Lasius* sp., 2 ♀♀ (Majzlan 2009).

Bátorové Kosihy village (8176c), 270 m, May – June 1986, pitfall traps, several ♀♀ leg. J. Csütörtöky (Majzlan 2009).

Skalica townlet – Veterník (7169c), 280 m, July 1986, ruderal xerothermic grassland, in the colony of *Formica* sp. under the peice of a tin, 1 ♀ (Majzlan 2009).

Silická Brezová village (7488d), 400 m, July 1986, sheep pasture, under the stone together with *Atelura formicaria*, 1 ♀ (Majzlan 2009).

NR Bokrošské slanisko near the Iža village (8275c/d), 105 m, July 13, 1987, salty grassland, under the stone, 1 ♀ (Majzlan 2009).

Príbelce village (7781c/d), 340 m, August 7, 1988, sundy quarry, under the stone, 1 ♀ (Majzlan 2009).

Horné Plachtince village (7781d), 450 m, June 2, 1990, in the pitfall trap in the meadow, 2 ♀♀ (Majzlan 2009).

Obyce village (7576d), 360 m, June 1990, in the pitfall trap near the quarry, 1 ♀ (Majzlan 2009).

Dobrohošť village (8070a), 120 m, June 1992, in the pitfall trap near the dike, 1 ♀ (Majzlan 2009).

Gabčíkovo – the island ‘Istragov’ (8171c/d), 130 m, June 1992, the wet maedow, in the pitfall trap, 1 ♀ (Majzlan 2009).

Natura 2000 Site „Devínske Jazero“ (7567c), 140 m, July 1992, sandy soil near the former bunker, in the pitfall trap, 1 ♀ (Majzlan 2009).

Malé Leváre village (7467d), 148 m, July 1992, under the stone near the dike, 1 ♀ (Majzlan 2009).

Ivanka pri Dunaji townlet (7869a/b), 150 m, July 12, 1992, under the stone near the flowerbed, 2 ♀♀ (Majzlan 2009).

Závod village – Borová, (7468c), 150 m, July 20, 1992, in the pitfall trap on the edge of the sand dune, 2 ♀♀ (Majzlan 2009).

NR Bezodné near the Plavecký Štvrtok village (7667b), 150 m, May 1993, edge of the sand dune near the alder forest, 1 ♀ (Majzlan 2009).

Bodíky village (8070a), 150 m, June 1993, a pasture, in the pitfall trap, 2 ♀♀ (Majzlan 2009).

Brodzany village – the Geradza valley (7476a), 300 m, August 1993, in the pitfall trap, 1 ♀ leg. P. Gajdoš (Majzlan 2009).

NR Vřšok near the Štúrovo town – well known as „Hegyfarok“ (8177d), 190 m, May 1994, under the stone on the xerothermic grassland together with *Atelura formicaria*, 1 ♀ (Majzlan 2009).

NR Dubník near the Sereď town (7672d), 185 m, July 1994, in the pitfall traps on the edge of oak forest, several ♀♀, leg. P. Hošťák (Majzlan 2009).

NR Devínska Kobyla (7767d), 200 m, July 1994, the quarry „Sandberg“, under the stone in the colony of *Lasius* sp., 1 ♀ (Majzlan 2009).

Kečovo village (7588b), 390 m, June 16, 1995, in the karren slope under the stone together with *Atelura formicaria*, 1 ♀ (Majzlan 2009).

Jelenec village – the castle ‘Gýmeš’ (7675a), 450 m, July 1995, near the lake under the oak trees, 1 ♀ (Majzlan 2009).

Dúbravy village – Iviny (7382c), 685 m, June 1996, under the stone in a pasture with juniper *Juniperus communis*, in the colony of *Lasius* sp., 1 ♀ A. Krištín leg.

Hriňová townlet – the Javorinka hill (7482b), 890 m, June 21, 1999, similar circumstances like the preceding record, 1 ♀ A. Krištín leg.

Nová Vieska village – NR Drieňová hora (8176b), 226 m, July 1996, near the abandoned quarry in the coppice of almond shrubs *Amygdalus nana*, 1 ♀ (Majzlan 2009).

Plavecký Mikuláš village – NR Kršlenica (7469d), 350 m, July 6, 1997, limestone slope, in the pitfall traps, several ♀♀ (Majzlan 2009).

Malé Kršteňany village – NR Veľký vrch (7376b/d), 440 m, July 1997, under the stone in the colony of *Lasius* sp. together with *Atelura formicaria*, 2 ♀♀ (Majzlan 2009).

Búč – NR Jurský Chlm (8277a), 120 m, August 1997, in the pitfall traps, 2 ♀♀ (Majzlan 2009).

Čachtice village (7272d), 300 m, July 1999, in the pitfall traps bellow the castle, 2 ♀♀ (Majzlan 2009).

Moravský Ján village (7468a), 160 m, August 15, 1999, under the concrete chunk near the railway, together with *Lasius* sp., 1 ♀ O. Majzlan leg.

Podhradie village – Nature Monument ‘Sivý kameň’ (7377b), 570 m, April 2000, 1 ♀ (Majzlan 2004).

Lúka village – NR Kňazi vrch (7373a), 350 m, June 2000, in the pitfall traps, 1 ♀ (Majzlan 2009).

Stupava townlet – Vrchná Hora (7768a), 278 m, July 2000, in the pitfall traps on the sandstone slope, 1 ♀ (Majzlan 2009).

Gbelce village (8176b), 125 m, July 13, 2000, under the stone near the shooting range, 1 ♀ (Majzlan 2009).

Dolné Vestenice townlet (7276c), 250 m, June 10, 2001, under the stone together with ants *Lasius* sp., *Atelura formicaria* and a very rare histereid-beetle *Satrapes sartorii* (Redtenbacher, 1858), 2 ♀♀ (Majzlan 2009).

Tribeč Mts – NR Žibrica (7674b), 470 m, June 12, 2001, forest steppe, under the fallen oak bark in the colony of *Myrmica* sp., 1 ♀ A. Krištín leg.

Pravenec village (7177b), 350 m, June 25, 2001, under the stone in the rural garden together with *Lasius niger* and *Atelura formicaria*, 2 ♀♀. Documented here also later: July 5, 2002 – 2 ♀♀, June 13, 2004 – 4 ♀♀, July 18, 2005 – 1 ♀ (Majzlan 2009).

Dobrá Niva village – Protected Site ‘Gavurky’ (7580b/d), 440 m, June 30, 2001, old oak grove, under the fallen oak bark, 1 ♀ A. Krištín leg.

Dolné Vestenice townlet (7276c), 320 m, May 18, 2002, edge of xerothermic oak forest, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc leg.

Strážovské vrchy Mts – Vápeč hill (7075d/7076c), 820 m, May 2, 2003, karst rocky slope, under the stone together with *Lasius niger* and *Claviger testaceus*, 1 ♀ (Franc 2004).

Malacky town (7568), 160 m, July 2003, in the pitfall trap on the sandy grassland with feather grass *Stipa boristhenica*, 1 ♀ (Majzlan 2009).

Domica village (7588b), 250 m, July 13, 2003, under the stone on a karst steppe grassland, 1 ♀ (Majzlan 2009).

Tribeč Mts – NR Zoborská lesostep (7674d), 390 m, July 11, 2003, forest steppe, under the fallen oak bark, 1 ♀ A. Krištín leg.

Beckov village – NR Beckovské Skalice (7273b), 374 m, July 13, 2003, in the pitfall trap, 1 ♀ (Majzlan 2009).

Dúbravy village – Iviny (7382c), 620 m, August 14, 2003, under the fallen log in a pasture with juniper *Juniperus communis*, 1 ♀ A. Krištín leg.

Hriňová townlet – ‘Pod Javorinkou’ (7483a), 755 m, September 20, 2003, similar circumstances like the preceding record, 1 ♀ A. Krištín leg.

Poľana Mts – Úplaz (7383), 960 m, September 20, 2003, similar circumstances like the preceding record, 1 ♀ A. Krištín leg.

Banská Bystrica town – ‘Pod Suchým vrchom’ (7280d), 460 m, April 14, 2004, xerothermic pasture, under the stone together with *Lasius niger*, 1 ♀ V. Franc & E. Černecká leg.

Tvrdošovce village (7974a), 115 m, May 2004, under the stone on a salty grassland, 1 ♀ (Majzlan 2009).

Chotín village (8175c), 110 m, August 5, 2004, under the concrete chunk, 3 ♀♀ (Majzlan 2009).

Banská Bystrica town – Protected Site Jakub (7280d), 460 m, May 14, 2005, xerothermic rocky slope, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc leg.

Viničné village – Šenkvický háj (7769b), 250 m, June 2005, in the pitfall trap on the edge of an oak forest, 1 ♀ leg B. Zápražný (Majzlan 2009).

NR Báb near the Nitra town (7673c), 220 m, June 10, 2005, in the glade of an oak forest, in the pitfall trap, June 10, 2005, 3 ♀♀ (Majzlan 2009).

Príbelce village (7781c/d), 400 m, May 7, 2008, open oak forest above the sundy quarry, under the stone together with *Formica fusca*, 1 ♀ V. Franc leg.

Dolné Vestenice townlet (7276c), 350 m, May 13, 2008, open xerothermic oak forest, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc & M. Ruttkayová leg.

Cerovo village (7780d), 413 m, July 1, 2008, open oak forest, in the colony of *Lasius emarginatus* under the stone, 3 ♀♀ M. Wiezik leg.

Banská Štiavnica town – the Calvary (7579a), 655 m, July 8, 2008, open park forest, under the lime bark together with *Lasius brunneus* and *Batrisus formicarius*, 1 ♀ (Franc 2008).

NR Jurský Šúr (7769c), 130 m, July 16, 2008 – 2 ♀♀ and April 20, 2008 – 1 ♀, in the pitfall trap in a salty grassland (Majzlan 2009).

Šuľa village (7682a), 390 m, July 2, 2010, edge of a xerothermic oak forest, under the stone together with *Formica fusca*, 1 ♀ V. Franc leg.

Dolné Vestenice townlet (7276c), 400 m, July 17, 2010, open xerothermic oak forest, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc leg.

Javorie Mts – Zálužná (not far off the Zvolen town, 7480b/d), 410 m, May 2011, open oak forest, 1 ♀ P. Potocký lgt.

Revúcka vrchovina Mts – Slizké village (7486c), 410 m, June 19, 2012, edge of an open beech forest, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc & T. Csegéni leg.

Revúcka vrchovina Mts – Hrušovo village (7486c), 310 m, April 20, 2013, xerothermic karst pasture, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc leg.

Dobrá Niva village – Podholienec (7580b), 674 m, June 2, 2013, edge of a xerothermic oak forest, under fallen oak bark together with *Lasius* sp., 1 ♀ A. Krištín leg.

Štiavnické vrchy Mts – Drastvica hill (7578c), 540 m, June 6, 2013, open deciduous (chiefly oak) forest, in the colony of *Formica fusca* under the stone, 1 ♀ V. Franc leg.

Spíšská Nová Ves town – the gardening area (7089c), 454 m, September 4, 2013, under the stone together with *Myrmica* sp., 1 ♀ A. Šestáková leg. (Šestáková 2013).

NR Rohy near the Stožok village (7482a/c), 440 m, September 9, 2013, oak forest steppe, under the fallen oak bark together with *Lasius platythorax*, 2 ♀ M. Wiezik leg.

Dobrá Niva village – Podholienec (7580b), 550 m, March 2, 2013, edge of a xerothermic oak forest, under the bark of an oak stump together with *Lasius brunneus* and *Batrisus formicarius*, 2 ♀ V. Franc leg.

Revúcka vrchovina Mts – Drienčany village (7586a), 270 m, xerothermic pasture, under the stone together with *Lasius niger*, 1 ♀ V. Franc leg.

NR Ponická Dúbrava (7380b), 558 m, July 10, 2014, under the bark of a dead fir together with *Lasius platythorax*, 1 ♀ M. Wiezik leg.

Zvolen town – Neresnická valley (7480d), 395 m, July 15, 2014, open oak forest, under the fallen oak bark, 1 ♀ P. Potocký leg.

NR Čenkovská lesostep (8277a), 115 m, September 23, 2014, forest steppe, under the bark of a dead staying poplar together with *Lasius platythorax*, 1 ♀ M. Wiezik leg.

Malé Kršteňany village – ‘Veľký vrch’ hill (7376b/d), 368 m, April 17, 2015, abandoned xerothermic pasture, under the stone together with *Tetramorium caespitum* and a very rare histereid-beetle *Satrapes sartorii*, 1 ♀ V. Franc & M. Šafanda leg.

Distribution of *Myrmecophilus acervorum*: almost throughout Europe with the exception of the cold regions of the north. Southern boundary of its extension in Europe is located below the Alps. The data on its distribution in Slovakia were incomplete and insufficient in the past. The first records for the Czech Republic was published by Seidl (1836) and Poláček (1942), in Moravia by Lang (1942); a larger number (81) of prevalently recent records from Moravia was published by Bezděčka, Kočárek & Šuhaj (2000). Old paper by Pungur (1900) reported the data from the former Austro-Hungarian Monarchy, but findings from Slovak territory are not yet available. This information is cited also by Obenberger (1926), but he supposes that the ant cricket obviously occurs in Slovakia as well. The first concrete records from Slovakia were published from the surroundings of the town of Rimavská Sobota (Csiki 1905), where J. Szabó found 2 females and 1 male. Nevertheless, Csiki himself later proved (1912) that the alleged male was a juvenile female specimen. Recently it may be ranked among quite frequent species, as it is alleged by Kočárek, Holuša & Vidlička (2005) as well.

Ecology and phenology: *Myrmecophilus acervorum* prefers the lower and warmer areas except high mountains, but in appropriate circumstances can reach altitudes up to about 1000 m. Kočárek et al. (2015) indicate that it occurs from lowlands to hilly country (approximately to 500 m). Our records include the altitude from 105 to 960 m. Its occurrence in altitudinal zones is given bellow (fig. 2). Referred records were realised from early spring to late September. Perhaps it may be found during all year, nevertheless information on its hibernation or diapause is not accessible.

Habitat preference: Ecological amplitude of *Myrmecophilus acervorum* is relatively wide. It usually occurs in grasslands, pastures, shrubby slopes, heathlands, forest edges and open deciduous forests. It is missing only in shady mountain forests and cold mountain sites at all. On the other hand, it may also live in ruderal habitats, suburban and urban environments (Gbelce village, the shooting range; Bratislava city – Vrakúňa: the Airport), in gardens (Pravenec village, in the rural garden, several specimens) and clearly wet habitats as well (alder forest in the Nature Reserve Svätajurský Šúr).

Relations with host ants: *Myrmecophilus acervorum* may occur together with many ant species; recent authors (Bezděčka, Kočárek & Šuhaj 2000; Kočárek et al. 2015) agree that it is about 20 species. The facts given in the first paper are remarkable. Species of the genus *Lasius* are clearly prevailing among host ants: 60 records, from these 25 concerns *L. niger* (Linnaeus, 1758), 14 concerns *L. flavus* (Fabricius, 1782) and 7 concerns *L. platythorax* Seifert, 1991. We have also confirmed the high preference of

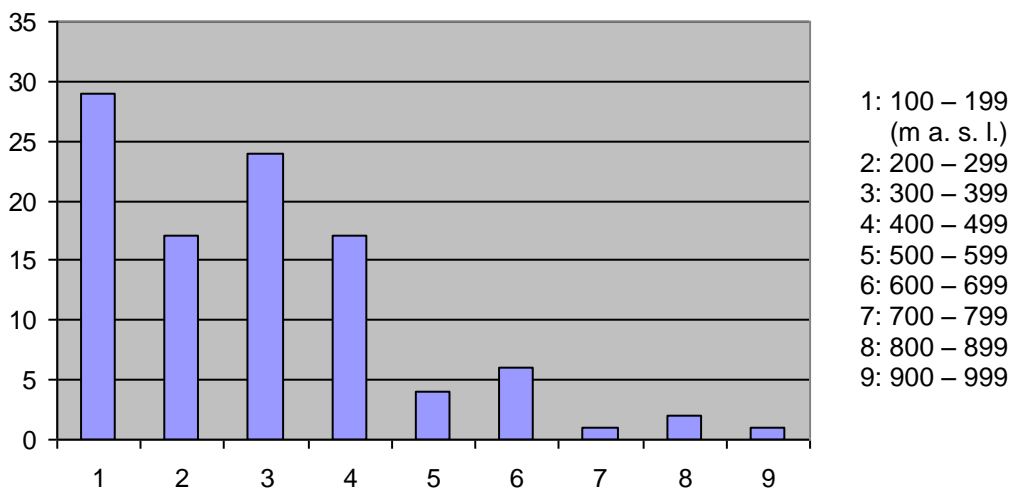


Fig. 2. Distribution of *Myrmecophilus acervorum* according to altitude

host ants from the genus *Lasius*. Minor differences are in the next two genera: *Formica* and *Myrmica*; it briefly reflects in the table 1 below. Möller (2002) dealt with distribution and ecology of the ant cricket in Germany and he mentions 15 particular species of host ants (see tab. 1). Nevertheless, the majority of our records (approximately 64 %) was carried out without ants. It contrasts with results of papers by Bezděčka, Kočárek & Šuhaj (2000) and Möller (2002). This paradox is probably due to the fact that we often use the method of pitfall traps. On the other hand, older records were often published without ecological circumstances, including host ants. Sampling circumstances of *Myrmecophilus acervorum* in our research are outlined in figure 3 below.

Regarding the type of symbiosis, it is a synoecious myrmecophile with certain features of symphyly. Nevertheless, it seems to be that is not strictly bound to the ants. This is confirmed by specimens caught under stones outside ants or in pitfall traps (more than 60 % of our records); obviously these are cases of active migration.

Trophic relations of ant crickets are insufficiently known. They probably feed on tiny mites in ant colonies, but may be also fed by ants. It is assumed they also feed on

Tab. 1. The occurrence of *Myrmecophilus acervorum* in the main group of host ants

The source ➡ Genus (Species) of host ant ↓	This paper		B, K & Š (2000)*		Möller (2002)	
	N [r]	%	N [r]	%	N [r]	%
<i>Lasius</i> sp.	23	62.16	60	72.29	79	49.07
<i>Formica</i> sp.	10	27.03	7	8.3	41	25.47
<i>Myrmica</i> sp.	3	8.11	12	14.46	24	14.90
<i>Tetramorium caespitum</i>	1	2.70	1	1.21	11	6.83
The rest taxa	–		3	3.61	6	3.73
Σ	37	100.00	83	100.00	161	100.00

* B, K & Š (2000) – Bezděčka, Kočárek & Šuhaj (2000), N [r] – number of records

remnants of ant pupae and larvae, or organic debris generally. Thus they may be considered to be carnivorous and omnivorous insects, or may be necrophagous occasionally.

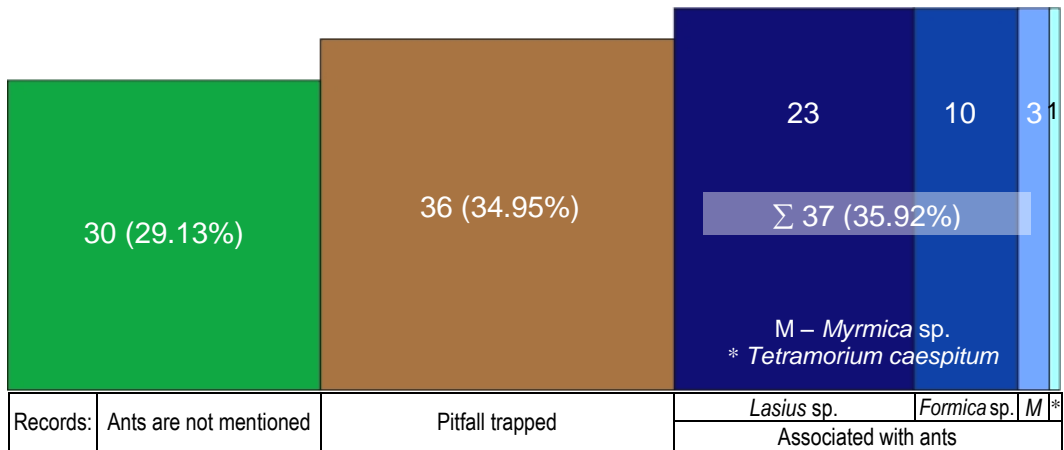


Fig. 3. Sampling circumstances of *Myrmecophilus acervorum*

Conclusion

In this paper 103 records of *Myrmecophilus acervorum* from Slovakia are mentioned and analysed. It has been found in 69 mapping squares up to now, but real distribution shall be obviously wider. It probably occurs almost in the whole territory of Slovakia, excepting high mountains. The data come mainly from our collections, few data from other authors. The apparent rarity of this species is due to its small size and hidden way of life. On the contrary, its ecological amplitude is relatively very wide, it was also found in disturbed habitats and in the urban area. It seems that the ant cricket is not strictly myrmecophilous, or at least that ant colonies does not need to reside permanently. It has been observed outside the ant colonies many times and often falls into the pitfall traps. This is also confirmed frequent active migration of this virtually blind insect species.

Frequent findings outside the ant colonies suggest that this species may have broader trophic amplitude – perhaps it is occasionally saprophytophagous species (?). Despite *Myrmecophilus acervorum* already does not rank among rare and ‘remarkable’ species, it deserves attention and the further research. This is due not only to his bizarre appearance and specific ecology. Moreover, taxonomic situation in this genus, especially in southern Europe, is unclear – it occurs here about 8 other species, hardly distinguishable. Some of them, especially *Myrmecophilus aequispinus* (Chopard, 1923), may potentially be discovered in southern Slovakia. And therefore the further investigation of small and ‘forgotten’ ant crickets is necessary.

References

1. Bezděčka P., Kočárek P. & Šuhaj J., 2000: Rozšíření cvrčíka *Myrmecophilus acervorum* (Orthoptera: Myrmecophilidae) na Moravě a ve Slezsku a poznámky k jeho biologii. Klapálekiana (Praha) 36: 7-17.

2. Chládek F., 1994: Rovnokřídlovce (Orthoptera), šváby (Blattoptera), modlivky (Mantoptera) a ucholaky (Dermaptera), p. 157-163. In: Rozložník M. & Karasová E. (eds.), Slovenský kras Chránená krajinná oblasť – biosférická rezervácia. Osveta, Martin, 479 pp.
3. Csiki E., 1905: Adatok a hangyásztücsök (*Myrmecophila acervorum* Panz.) ismeretéz. Allátani Közlemények, 4(2): 97-100.
4. Čejchan A., 1959: Orthopteroidní hmyz státní přírodní rezervace „Zádiel“ a nejbližšího okolí (Jihoslovenský kras). Časopis Slezského musea, 8(2): 97-114.
5. Dobšík B., 1959: Rovnokřídli – Orthoptera, p. 195-216. In: Kratochvíl J. (ed.), Klíč zvířeny ČSR, III. Československá akademie věd, Praha, 869 pp.
6. Franc V., 2004: Beetles (Coleoptera) of the Strážovské vrchy Mts with special reference to bioindicatively significant species, p. 103-115. In: Franc V. (ed.), Strážovské vrchy Mts – research and conservation of Nature. Proceedings of the conference, Belušké Slatiny (Slovakia), October 1 & 2, 2004, 164 pp.
7. Franc V., 2008: O kalvárii s kalváriami. Enviromagazín (SAŽP, Banská Bystrica) 13/6: 20-21.
8. Gulička J., 1967: Orthoptera, Blattodea, Mantodea, Dermaptera zátopeného územia pod Vihorlatom. Acta Fac. Rer. Natur. Univ. Comen., Zoológia (Bratislava) 12: 41-62.
9. Gulička J., 1974: Fauna Devínskej Kobyly, p. 73-99. In: Mišík M., Gulička J. & Urvichiarová E. (eds.), Devínska Kobyla. Obzor, Bratislava, 108 pp.
10. Heller K. G., 2013: Fauna Europaea: Orthoptera. Fauna Europaea version 2.6.2, <http://www.faunaeur.org>
11. Kočárek P., Holuša J. & Vidlička L., 2005: Blattaria, Mantodea, Orthoptera a Dermaptera České republiky. Kabourek, Zlín, 348 pp.
12. Kočárek P., Holuša J., Vlk R. & Marhoul P., 2015: Rovnokřídli (Insecta: Orthoptera) České republiky. Academia, Praha, 286 pp.
13. Lang V., 1942: Faunistické poznámky 1-4. Entomologické listy (Brno) 5: 68-69.
14. Majzlan O., 2004: Vybrané skupiny článkonožců (Coleoptera, Opiliones, Blattodea, Ensifera, Caelifera et Hymenoptera: Chrysididae) Přírodnej pamiatky Sivý kameň v obci Podhradie (okres Prievidza). Rosalia (Nitra) 17: 75-98.
15. Majzlan O., 2009: Rozšírenie svrčika mraveniskového *Myrmecophilus acervorum* (Panzer, 1799) na Slovensku. Natura Carpatica (Východoslovenské múzeum, Košice) 50: 147-152.
16. Möller J., 2002: Zu Vorkommen und Ökologie der Ameisengrille *Myrmecophilus acervorum* (Panzer, 1799) um Eberswalde (Ensifera). Entomologische Nachrichten und Berichte, 46: 136-138.
17. Obenberger J., 1926: Rovnokřídli hmyz (Orthoptera a Dermaptera) Republiky československé. Fauna et Flora Čechoslovenica I. Druhá Třída ČSAVU, Praha, 224 pp.
18. Poláček V., 1942: Příspěvek k rozšíření cvrčka *Myrmecophila acervorum* Panz. v Čechách. Čas. Čes. spol. entomol. (Praha) 39: 143-144.
19. Pungur J., 1900: Orthoptera, Insecta. Fauna Regni Hungariae III. Arthropoda, Budapest, 46 pp.
20. Roubal J., 1905: Prodromus myrmecophilů českých. Věstník Královské České Společnosti Náuk. Třída mathematicko-přírodovědecká 15: 1-41.
21. Seidl W., 1836: Die Orthopteren Böhmens. Weitwebers Bieträge zur Gesamnten Natur und Heilwissensch, 1(8): 205-223.
22. Szabó J., 1912: *Myrmecophila acervorum* himjerol. Allátani Közlemények, 11: 116-125.
23. Šestáková A., 2013: FotoNet, wild nature photography. In «<http://www.fotonet.sk/?idp=100542&loc=4>»