

Records of interesting flies (Diptera) attracted to meat baited pyramidal trap on sapping stump of European walnut (*Juglans regia*) in Central Bohemia (Czech Republic)

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Abstract: A pyramidal trap with combined bait is described and illustrated. The trap inserted above sapping stump of European walnut (*Juglans regia*) in a site in Central Bohemia near Uhlířské Janovice in 2010 yielded a rich spectrum of flies (Diptera). Records of 24 species most interesting from the faunistic, biological and nature conservancy point of view are given with comments upon their distribution and biology but a number of other captured species are also mentioned. Besides species developing in or attracted as adults to sap runs [e.g. Syrphidae: *Ceriana conopsoides* (Linnaeus, 1758), Aulacigastridae: three *Aulacigaster* spp., various Drosophilidae], other important components were formed by saproxylic [Xylomyidae: *Solva marginata* (Meigen, 1820), some Stratiomyidae, many Lonchaeidae, Milichiidae: *Milichia ludens* (Wahlberg, 1847), some Muscidae], mycophagous (some Asteiidae, Sphaeroceridae, Drosophilidae), necrophagous (some Sepsidae, Acartophthalmidae, Milichiidae, Sphaeroceridae) and saprophagous (some Sepsidae, Carnidae, Milichiidae, Sphaeroceridae) species, both latter attracted to meat-bait used in the trap. *Aulacigaster falcata* Papp, 1998 is the first record from Bohemia.

Key words: Diptera, pyramidal trap, sapping stump of *Juglans regia*, meat-bait, new records

Introduction

A number of various trapping methods were developed to capture flies (for review and descriptions of traps see e.g. McLean 2010). This contribution is aimed at describing one of recently developed (or modified) trapping device called the pyramidal trap (see Fig. 3), and at the presenting some results achieved by testing its effectiveness with regards to the qualitative composition of the species spectrum in the locality of Bláto near Uhlířské Janovice (Central Bohemia). Pyramidal (or pyramid) traps have formerly been used for monitoring and mass trapping of tsetse flies (e.g. Laveissière & Grébaud 1990), but mostly they have been used as emergence traps buried in soil (Barták et al. 2008) or dipped in water for monitoring the biomass production of culicids (Walton 2009). Ježek & Hájek illustrated (2007, Fig. 49) a pyramidal trap exposed above a decaying fir stump (without the collecting head).

The combination of several different substrates (attractive to flies) placed under the trap as described below (see Material and methods) was expected to enrich the species spectrum in the material trapped. The arrangement of the trap over the sapping stump of the European walnut was particularly interesting inasmuch as the affinities of flies to sap running down this tree have yet to be studied. Indeed, an array of species of various biology and microhabitat associations were collected, and records of the most interesting of these are given below.

Material and methods

Pyramidal trap (Fig. 3) of quadrangular pyramid shape (effective capture area = bottom of the trap = 1 m²) was made of fine polyester fabric (mesh less than 0.5 mm). The collecting head was made of PET bottle with an opening drilled in its upper part where a short passage tunnel connected the trap with the collecting bottle. The connection of the trap with collecting bottle was made according to utility model “Insect trap” No. 20571 (Industrial property office of the Czech Republic): polyester fabric of the upper part of the trap was fixed between middle and outer of the three concentric cylinders made of small PET bottles; the entire passage tunnel

was fixed to collecting bottle by a rope. The collecting bottle was filled with 70% ethylalcohol up to the lower margin of passage tunnel. Approximately once a month, trapped material was collected by carefully sieving the volume of collecting head by fine mesh and inserting samples into fresh 70 % ethylalcohol. The samples were stored in a freeze box (-20 °C) until processing. Only voucher specimens were selected from a large number of specimens (some 1 litre volume of material sampled each month) by the morphospecies method (but see eventually notices under individual species). Dry preparations were performed by a modified “Vockeroth’s method” (for details see Barták 1997).

The trap was inserted above a freshly cut and sapping stump of a European walnut (*Juglans regia*) on the 27th of March, 2010. The trap was set with the small container filled by sawdust of a deciduous tree, in which bait (a decaying pig foot) was buried. Dates of samples: 24th April, 29th May, 3rd July (trap was dry due to long exposition), 11th July (meat bait removed), 11th August, 11th September, 17th October and 28th October 2010. Sampling site: Bláto near Uhlířské Janovice (Fig. 2), (49°53′27.74″N, 15°1′48.33″E, [6156]), an extensively managed private garden (formerly a pond), with an alder wetland in one corner and two small brooks bordering it. A narrow vegetation corridor with old poplars occurs nearby (the closest are some 20 m from the trap, see Fig. 3). In the surrounding areas of Bláto there are huge agricultural fields and stubbles, and the nearest forests (mostly Norway spruce monocultures) are 2.4 to 2.7 km away and much “better” (more natural) forests are at distance of 5.1 to 7.2 km.

Results

XYLOMYIDAE

Solva marginata (Meigen, 1820)

Material: 29.v.-3.vii., 1♂1♀, 3.-19.vii., 3♀.

A Euroasian species, in Europe distributed from Great Britain and Sweden to Spain, Corsica, Italy and Bulgaria, also in the Near East and through western Siberia to Mongolia and China. The larvae are apparently saproxylic and micropantophagous and have been reared from beneath loose bark and rotten wood of deciduous trees (Nagatomi & Rozkošný 1997). Out of the three xylomyid species known from the Czech Republic, this species is by far most common, however, in the trap we found surprisingly great number of adults (about 60), out of them above mentioned voucher specimens were selected.

STRATIOMYIDAE

Neopachygaster meromelas (Dufour, 1841)

Material: 3.-19.vii., 1♀, 11.vii.-11.viii., 5♀.

A European species, known to occur from Fennoscandia to Spain, North Caucasus and Near East. Generally considered rare in Central Europe. The larvae live in the moist detritus beneath loose bark of dead deciduous trees (Rozkošný 1983).

In addition to this species two other saproxylic Stratiomyiidae were found in the trap, *Pachygaster atra* (Panzer, 1798) and *P. leachii* Curtis, 1842.

SYRPHIDAE

Ceriana conopsoides (Linnaeus, 1758)

Material: 11.vii.-11.viii., 1♀.

A widely distributed Palearctic species. In Central and West Europe it is very rare and decreasing with sporadic occurrence in lowland deciduous (*Fagus/Quercus*) forests with overmature trees. Saproxylic larvae live in sap runs and damp tree-holes of deciduous trees which agree with our record. Included in the recent regional Red list as an endangered species (Mazánek & Barták 2005).



Fig. 1: Detailed image of the trap position in a garden in the village of Bláto (point A). Source: <http://www.mapy.cz>

Fig. 2: Trap situated at point A, in the village of Bláto, 2.7 km NWW of Uhlířské Janovice, Kolín district. Source: <http://www.mapy.cz>

Fig. 3: A pyramidal trap on sapping stump of European walnut (*Juglans regia*) with a meat-bait in plastic container.

***Tropidia scita* (Harris, 1776)**

Material: 29.v.-3.vii., 1♀, 3.-19.vii., 1♂.

A Transpalaeartic species. In Central Europe it is uncommon and local in waterside vegetation of pools, canals and beside slow-flowing rivers mostly in lowlands. Saprohagous larvae probably inhabit the rotting plant debris along the water's edge, occurring in reed beds, etc. of fens (Speight 2003). We found some 10 specimens in the trap from which above mentioned voucher specimens were selected.

***Eristalis intricaria* (Linnaeus, 1758)**

Material: 3.-19.vii., 2♀.

A Eurosiberian species with subboreal distribution in Europe. In Central Europe it is moderately common, mostly in wetlands such as fens, fen carr, raised bogs, poorly-drained deciduous forests and humid, seasonally-flooded grasslands mostly in lowlands. Saprohagous larvae occur in semi-liquid mud and fen peat beside water, in field drains and slurry (Speight 2003).

LONCHAEIDAE

***Lonchaea tarsata* Fallén, 1820**

Material: 3.-19.vii., 1♀.

The species known from western, southern and central Europe and in Finland, rare in the Czech Republic (Máca et al. 2005a). According to MacGowan & Rotheray (2008) it is common in the Mediterranean but there has been no record of its biology. The present record from the sapping stump of walnut is the first indication concerning its biology, which may also explain its scarcity in the more northern parts of its distribution where walnut trees are allochthonous and lacking in frequently sampled biotopes.

The representatives of Lonchaeidae occurred rather abundantly (135 specimens were selected from the rich material) in the trap and also the species richness (16 species) was high. Larvae of some of the collected species are scavengers on decaying herbs, viz. *Lonchaea chorea* (Fabricius, 1781) and *Setisquamalonchaea fumosa* (Egger, 1862). *Chaetolonchaea dasyops* (Meigen, 1826), *Earomyia viridana* (Meigen, 1826) and *Protearomyia nigra* (Meigen, 1826), all known to occur frequently outside woods, are probably also bound to the herbal layer. The above mentioned five species comprised about half of the number of lonchaeid specimens collected. The other half was represented by species developing in rotting wood. *Lonchaea palposa* Zetterstedt, 1847 (24 specimens), *L. scutellaris* Rondani, 1874 (18 specimens), *L. fugax* Becker, 1895 (10 specimens), *L. peregrina* Becker, 1895 (2 specimens) and *L. stackelbergi* Czerny, 1934 (1 specimen) are known to develop predominantly under bark of *Populus* spp. (which grow in close vicinity), and it may be presumed that the walnut tree, with similar wood consistence, may also serve as their breeding substrate. The remaining captured species are known to develop predominantly in other tree species (*L. contigua* Collin, 1953 and *L. contraria* Czerny, 1934 predominantly in beech, *L. sylvatica* Beling, 1873 in a wide variety of deciduous and coniferous trees) or their biology is largely unknown (*L. hyalipennis* Zetterstedt, 1847, *L. tarsata* Fallén, 1820, *L. postica* Collin, 1953).

SEPSIDAE

Meroplius minutus (Wiedemann, 1830)

Material: 11.vii.-11.viii., 1♀.

Broadly distributed but everywhere rare Holarctic and Oriental species. Its finding in our trap agrees with previous observations that the species is attracted to carcasses and rotting fungi (Pont & Maier 2002). Larva is a saprophagous generalist, living in excrements and various rotting organic substrates. The species is declining at least in Europe and, from this reason, it was listed as vulnerable in Czech Red list (Barták 2005).

Sepsis pseudomonostigma Ursu, 1969

Material: 11.viii.-11.ix., 1♀.

Little known, probably West Palaearctic species. In Europe with southern and south-eastern distribution. It is a local species in Central Europe, from the Czech Republic firstly recorded by Barták et al. (1997). Interestingly, our trap was situated some 2 km from the place where mass occurrence of this species was observed.

ODINIIDAE

Neoalticomerus formosus (Loew, 1844)

Material: 24.iv.-29.v., 1♀.

A widespread Palaearctic species, in Europe known from Central Europe, Italy and Scandinavia. It is uncommon in the Czech Republic (Máca et al. 2005b). Larvae probably develop in galleries of wood-boring beetles (Ferrar 1987). Adults occur in humid deciduous forests and are attracted to exuding sap on trees.

In addition to this species also *Odinia boletina* (Zetterstedt, 1848), usually occurring on bracket fungi (particularly *Fomes fomentarius*), has been captured in the trap.

AULACIGASTRIDAE

Aulacigaster falcata Papp, 1998

Material: 27.iii.-24.iv., 1♂1♀, 24.iv.-29.v., 2♀.

This little known species has hitherto been recorded from Germany, Switzerland, Italy, Hungary, Croatia and Greece (Kassebeer 2001) and recently also from the Czech Republic (S. Moravia: Podyjí – Roháček & Máca 2010). It is mainly associated with oak forests where its larvae develop in sapping runs of oak species (*Quercus* spp.), more rarely of other trees (*Carpinus*, *Betula*, *Morus*, *Prunus*), see Papp (1998) and Kassebeer (2001). The above record is the first from Bohemia; it is also important by demonstrating the association of the species with sap of an additional tree species (*Juglans regia*).

Interestingly, the species was found together (in the same dates) with both other Central European *Aulacigaster* species, viz. *Aulacigaster leucopeza* (Meigen, 1830) (common) and *Aulacigaster pappi* Kassebeer, 2001 (as frequent as *A. falcata*).

STENOMICRIDAE

Podocera soniae (Merz & Roháček, 2005)

Material: 3.-19.vii., 1♀.

This recently described species is known from Germany, Switzerland, Czech Republic, Slovakia, Romania, Bulgaria (Merz & Roháček 2005) and Sweden (Roháček 2011).

Interestingly, the type locality of this species lies not far from the above record (C. Bohemia: Kunice). Adults are known to occur rarely in wet to dry grassland habitats as well as in thin forests, from lowland to submontane altitudes (Merz & Roháček 2005). There are only a few records from the Czech Republic (both Bohemia and Moravia, see Merz & Roháček 2005) and the species is considered vulnerable (in "red book") in the country by Roháček (2005a; listed as *Stenomicroa delicata*). The above record from sapping stump is interesting although it could represent an occasional occurrence.

ASTEIIDAE

Leiomyza dudai Sabrosky, 1956

Material: 29.v.-3.vii., 1♀.

The record of this common and widespread Eurasian species is interesting because it is a mycophagous species developing in sporocarps of various fungi (Ševčík 2010).

ACARTOPHTHALMIDAE

Acartophthalmus bicolor Oldenberg, 1910

Material: 24.iv.-29.v., 1♂.

This widespread Holarctic species has necrophagous larvae. Adults can be found on carrion, more rarely also on decaying fungi, both in forested and open habitats. The specimen was surely attracted to meat bait on the stump because it can be easily caught in meat-baited traps (see Roháček et al. 2005a).

CARNIDAE

Meoneura vagans (Fallén, 1823)

Material: 24.iv.-29.v., 6♂1♀ (1♂1♀ in cop.), 3.-19.vii., 1♂.

A Holarctic species, in Europe not found southerly to Hungary. It is frequent in the Czech Republic (Roháček 1996; Roháček et al. 2005b), relatively eurytopic and probably widely saprophagous (necrophagous-coprotophagous) as larva but infrequent in meat-baited traps (Roháček 1996). Therefore, it is interesting that only this single species of *Meoneura* was recorded in our trap.

MILICHIIDAE

Milichia ludens (Wahlberg, 1847)

Material: 3.-19.vii., 1♂.

This temperate and North European species, infrequent in the Czech Republic (cf. Roháček et al. 2005c), is associated with well preserved forested areas. Its saproxylic larvae develop in rotting tree stumps. In the Czech Republic it is classified as vulnerable species (Roháček 2005b).

Desmometopa microps Lamb, 1914

Material: 3.-19.vii., 1♂.

The species, originally widespread in the Oriental, Afrotropical and SE Palaearctic Regions, has recently expanded to Central Europe including the Czech Republic (for previous records see Roháček 2006; Roháček & Máca 2010). This record confirms the rapid spreading of this alien species in the Czech Republic as presupposed by Roháček (2006).

Apart from the above listed species, 4 additional species of Milichiidae were recorded in the trap, including the widely saprophagous *Desmometopa sordida* (Fallén, 1920), *Leptometopa latipes* (Meigen, 1830) and *Madiza glabra* Fallén, 1820 but also myrmecophilous *Phyllomyza securicornis* Fallén, 1823.

TRIXOSCELIDIDAE

Trixoscelis similis Hackman, 1970

Material: 3.-19.vii.2010, 1♂.

A European species, relatively frequent in warm areas of the Czech Republic (cf. Roháček & Barták 2001; Roháček et al. 2005d). It is clearly associated with forest-steppe habitats. The above record from the trap on stump is interesting although probably occasional.

SPHAEROCERIDAE

Opalimosina (Hackmanina) czernyi (Duda, 1918)

Material: 27.iii.-24.iv., 1♂1♀.

This uncommon transpalaeartic species (cf. Marshall et al. 2011) is restricted to zone of deciduous forests. The above record is interesting for two reasons: (1) it is a woodland species, (2) it is clearly associated with fungi (larval mycophagy was recently demonstrated by rearing from *Meripilus giganteus* – see Ševčík 2010).

Thirteen additional species of Sphaeroceridae were recorded together with *O. czernyi*, viz. *Ischiolepta nitida* (Duda, 1920), *I. pusilla* (Fallén, 1820) (abundant), *Sphaerocera monilis* Haliday, 1836, *Bifronsina bifrons* (Stenhammar, 1855), *Chaetopodella scutellaris* (Haliday, 1836), *Coproica hirticula* Collin, 1956, *C. hirtula* (Rondani, 1880), *Elachisoma aterrimum* (Haliday, 1833), *Gonioneura spinipennis* (Haliday, 1836), *Eulimosina ochripes* (Meigen, 1830), *Opalimosina (Opalimosina) mirabilis* (Collin, 1902), *Spelobia clunipes* (Meigen, 1830) and *Trachyopella (Trachyopella) lineafrons* (Spuler, 1925). Most of these largely polysaprophagous species were probably attracted to meat bait in the trap on the stump but the occurrence of *Sphaerocera monilis* is interesting because it is another infrequent woodland species with distinct preference to rotting sporocarps of fungi.

DROSOPHILIDAE

Cacoxenus indagator Loew, 1858

Material: 27.iii.-24.iv., 2♀, 24.iv.-29.v., 2♂3♀.

A European species; not yet recorded in Scandinavia but also known from Israel. It is uncommon in the Czech Republic (Máca et al. 2005c) and occurs very locally. Larvae are commensals of larvae in nests of bees (Apidae: *Osmia* spp., see Baechli et al. 2004) and adults may be attracted to exuding tree sap and were therefore captured in the trap.

Drosophila (Sophophora) tristis Fallén, 1823

Material: 27.iii.-24.iv., 1♂.

A Palaearctic species, in Europe not recorded from European Russia and in northern Scandinavia, rare in the Czech Republic. It is a stenotopic species occurring predominantly in tree canopies (Baechli et al. 2004) at banks of small woodland creeks but its biology is poorly known.

Apart from the two above mentioned species, 12 additional drosophilid species were trapped. They represent a mixture of 5 common synanthropic species, viz. *Drosophila*

(*Dorsilopha busckii* Coquillett, 1901, *Drosophila* (s. str.) *funnebris* (Fabricius, 1787), *D.* (s. str.) *hydei* Sturtevant, 1921, *D.* (s. str.) *immigrans* Sturtevant, 1921, *D.* (*Sophophora*) *melanogaster* Meigen, 1830, 4 mycetophagous species: *Leucophenga maculata* (Dufour, 1839), *Drosophila* (s. str.) *limbata* von Roser, 1840, *D.* (s. str.) *testacea* von Roser, 1840 and *Hirtodrosophila cameraria* (Haliday, 1833), 2 species associated with fallen and diseased tree trunks in natural-type forests, viz. *Scaptodrosophila rufifrons* (Loew, 1873) and *Stegana* (*Steganina*) *coleoptrata* (Scopoli, 1763) and, rather surprisingly, only one species of *Chymomyza*, viz. *C. costata* (Zetterstedt, 1838) which otherwise occur commonly on sap runs on wounded trees.

MUSCIDAE

***Phaonia boleticola* (Rondani, 1866)**

Material: 11.vii.-11.viii., 1♂.

A temperate West Palaearctic species rarely collected. Its larvae develop in fungi (found in *Boletus luridus* - cf. Hennig 1955-64).

***Phaonia canescens* Stein, 1916**

Material: 11.viii.-11.ix., 1♂1♀.

A Palaearctic species, ranging from Great Britain and Sweden through Central Europe to France, Near East and the Far East of Russia. The puparium was found under bark of fallen pine (Hennig 1955-64); recently the species has been reared from decaying logs of poplars (Gregor et al. 2002).

***Potamia littoralis* Robineau-Desvoidy, 1830**

Material: 11.vii.-11.viii., 1♂, 11.viii.-11.ix., 9♂, 11.ix.-17.x., 1♂

A Holarctic species, distributed throughout Europe, also in Myanmar in the Oriental Region. The larva is probably a saprophagous generalist (occasionally predaceous), reared from various decaying organic substrates including fungi and decaying woods. The species is found mostly individually, our records are surprisingly numerous. Adults were probably attracted by meat because they regularly visit cadavers (Hennig 1955-64).

Besides the above mentioned species, the following rare muscids were also found in the trap: *Phaonia gobertii* (Mik, 1881), *Helina latitarsis* Ringdahl, 1924 and *Eudasyphora zimini* (Hennig, 1963).

RHINOPHORIDAE

***Tricogena rubricosa* (Meigen, 1824)**

Material: 11.vii.-11.viii., 4♂4♀.

A European species. In Central Europe it is rather rare species. Larva parasitizes woodlice (Pape 1998). Interestingly, other two species of Rhinophoridae were found in the trap, viz. *Rhinophora lepida* (Meigen, 1824) and *Melanophora roralis* (Linnaeus, 1758).

Discussion and conclusions

From the above results (though based on records of the most interesting species only), it is obvious that the pyramidal trap, particularly when provided with several different bait media, is capable of capturing very diverse dipterous material, including rare and local species which are otherwise uneasy to find due to their confinement to special microhabitats or breeding

substrates. In this way the pyramidal trap can rival Malaise traps because it combines the characteristics of the emergence trap, bait trap, and partly intercept or Malaise traps.

This was also demonstrated in our case despite the fact that our results were based only on selected taxa. The most important component of the captured flies was formed by species directly associated with the stump of the European walnut under study, therefore either by those developing in sap runs or attracted as adults to sap [e.g. Syrphidae: *Ceriana conopsoides*; Aulacigastridae: three species of *Aulacigaster* spp. including *A. falcata*; various species of Drosophilidae including *Cacoxenus indagator*] or those living in dead wood, under bark and in tunnels of other saproxylic insects [Xylomyidae: *Solva marginata*; several species of Stratiomyidae; Lonchaeidae: a number of species of *Lonchaea*; Odiniidae: *Neoalticomerus formosus*; Milichiidae: *Milichia ludens*; Drosophilidae: *Stegana coleoprata*; Muscidae: *Phaonia canescens*].

In addition, a number of mycophagous species (Asteiidae: *Leiomyza dudai*; Sphaeroceridae: *Opalimosina czernyi*, *Sphaerocera monilis*; Drosophilidae: 4 species including the uncommon *Hirtodrosophila cameraria*; Muscidae: *Phaonia boleticola*), necrophagous (Sepsidae: *Meroplus minutus*, Acartophthalmidae: *Acartophthalmus bicolor*, Milichiidae: *Leptometopa latipes*, *Madiza glabra*) and saprophagous species (various Sepsidae, Carnidae, Milichiidae, Sphaeroceridae) were also caught because they were obviously attracted to meat-bait used in the trap.

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Nálezy zajímavých druhů dvoukřídlých (Diptera) přilákaných do pyramidální pasti na mokvajícím pařezu ořešáku vlašského (*Juglans regia*) s návnadou hniječím masa ve středních Čechách (Česká republika)

Je popsán a vyobrazen nový model pyramidální pasti, která byla instalována nad mokvajícím pařezem ořešáku vlašského (*Juglans regia*) s návnadou masa na lokalitě Bláto poblíž Uhlířských Janovic ve středních Čechách v roce 2010. Během celosezónní expozice tato past zachytila bohaté druhové spektrum dvoukřídlého hmyzu (Diptera). Je prezentován výčet nálezů 24 druhů zajímavých z faunistického, bionomického nebo ochranářského hlediska s komentáři k jejich rozšíření a bionomii, přičemž je zmíněna ještě řada dalších zachycených druhů. Kromě druhů, které se vyvíjejí nebo jsou lákány jako imága na mokvající mízu [např. Syrphidae: *Ceriana conopsoides* (Linnaeus, 1758), Aulacigastridae: 3 druhy rodu *Aulacigaster*, různé druhy čeledi Drosophilidae], tvořily další významné složky zachycených dipter druhů saproxytické [Xylomyidae: *Solva marginata* (Meigen, 1820), několik druhů čeledi Stratiomyidae, četné druhy čeledi Lonchaeidae, Milichiidae: *Milichia ludens* (Wahlberg, 1847) a některé druhy čeledi Muscidae], mykofágní [některé druhy z čeledí Asteiidae, Sphaeroceridae a Drosophilidae], nekrofágní [několik druhů z čeledí Sepsidae, Acartophthalmidae, Milichiidae, Sphaeroceridae] a široce saprofágní [některé druhy z čeledí Sepsidae, Carnidae, Milichiidae, řada druhů čeledi Sphaeroceridae], při čemž poslední dvě skupiny byly zřejmě přilákané na masovou návnadu, která byla v pasti také použita. Nález druhu *Aulacigaster falcata* Papp, 1998 (Aulacigastridae) je prvním záznamem výskytu v Čechách.

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