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# *Tetanops myopina* Fallén, 1820, a psammophilous species of Otitinae (Diptera: Ulidiidae) found in a sandpit in the northeastern part of the Czech Republic

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*Tetanops myopina* Fallén, 1820, a psammophilous species of Otitinae (Diptera: Ulidiidae) found in a sandpit in the northeastern part of the Czech Republic. – Acta Mus. Siles. Sci. Natur., 64: 1-10, 2015.

**Abstract:** *Tetanops myopina* Fallén, 1820 (Diptera: Ulidiidae) is recorded from the Czech Republic for the first time, based on specimens found in the sandpit Závada near Hlučín (grid mapping code 6074). Because *T. myopina* is generally a maritime species, living on costal sand dunes of the Irish, North and Baltic Seas and partly the Atlantic Ocean (Ireland and Wales only), this surprising record is treated in detail with a description of the microhabitat and a discussion of the biology and biogeography of the species and the historical origin of this inland population.

**Key words:** Diptera, Ulidiidae, Otitinae, *Tetanops myopina*, new record, biology, sandy habitat, psammophily, distribution, Czech Republic

## Introduction

The genus *Tetanops* Fallén, 1820 is a Holarctic group of the subfamily Otitinae comprising a total of 15 species (the last added by Chen & Wang 2008 from China), seven of which occur in Europe and adjacent archipelagos (Kameneva 2008; Kameneva & Greve-Jensen 2013). Six of the European species belong to the nominative subgenus and only one, viz. *T. sintenisi* Becker, 1909, to the subgenus *Eurycephalomyia* Hendel, 1907. In Central Europe, only two species of *Tetanops* are known, the last mentioned (*T. sintenisi*) and *T. myopina* Fallén, 1820 living largely on the coast of the Baltic Sea; none of them have hitherto been recorded from the Czech Republic or Slovakia. While *T. sintenisi* is a widespread Transpalaearctic species with scarce records in Europe (cf. Smit & Tuinstra 2014), *T. myopina* has rather restricted distribution in countries surrounding the Irish, North and Baltic Seas (in Ireland and Wales also at Atlantic coast) but appears to be common on coastal sand dunes in these maritime areas (Kabos & van Aartsen 1984; Kameneva 2008).

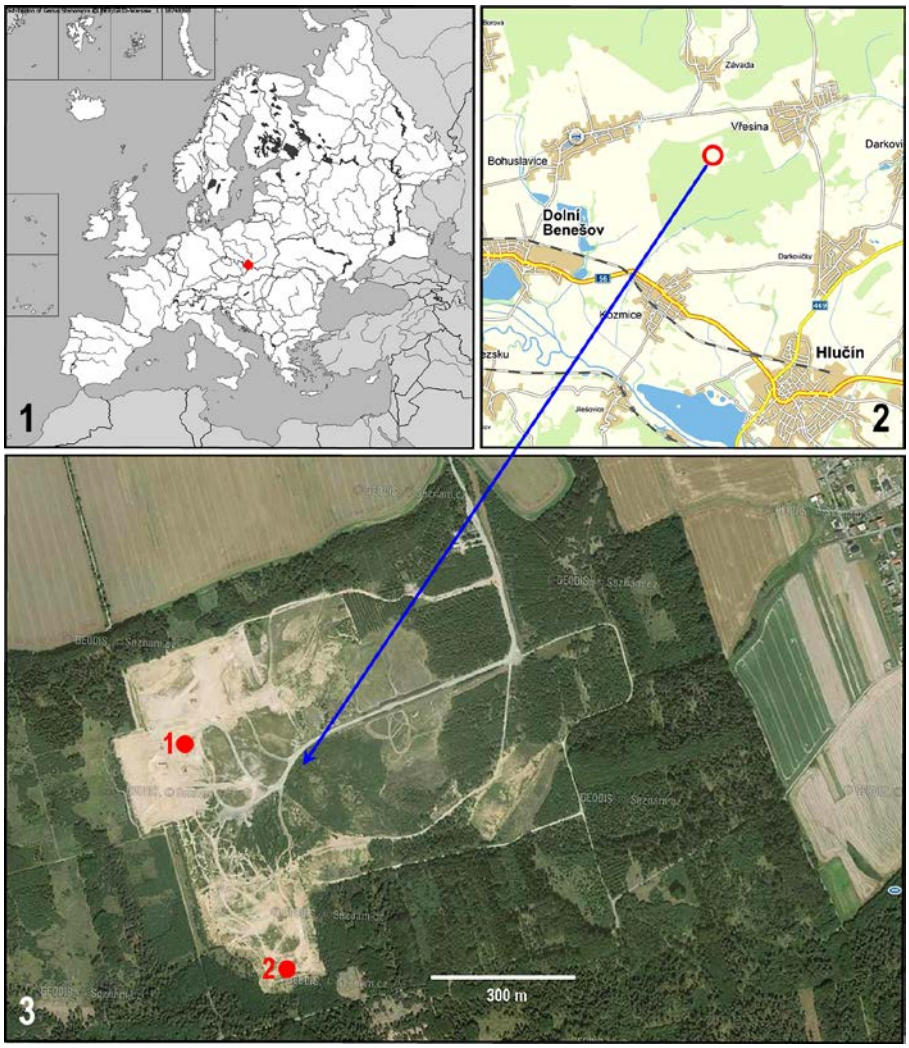
Because of its stenotopic association with costal sand dunes *Tetanops myopina* has not been expected to occur in the Czech Republic or Slovakia. Consequently, the recent discovery of a population in a sandpit in the Hlučín region (NE part of the Czech Republic), in an area situated far not only from sea but also from large rivers or lakes with a natural shore dune ecosystem, is considered rather surprising and raising a question about its origin.

Therefore, the first finding of *T. myopina* in the Czech Republic is described in detail below, including characteristics of the microhabitat where adults were found and discussion of the (rather limited) literary data about its biology and distribution (particularly in inland Europe), including a proposal of hypotheses about the possible origin of this inland population.

## Material and methods

All specimens of *T. myopina* recorded below were collected in a large sandpit (see Figs 3, 11) near the village Závada (Fig. 2) and are deposited in the collection of Slezské zemské muzeum, Opava, Czech Republic (SMOC). About half of them were killed in the field, the others were retained alive for photography. Subsequently all killed specimens were air-dried and mounted on pinned triangular cards in the course of the study. The collected living specimens were retained in plastic tubes to be photographed shortly after being captured in special glass boxes by means of a digital camera (Canon EOS 60D) with a macro lens (Canon MP-E

65 mm 1–5×) and ring macro flash (Canon MR-14EX). Dry-mounted specimens have been examined using two types of binocular stereoscopic microscopes (Reichert, Olympus). Habitat photographs were taken by digital cameras Canon EOS 60D and Sony NEX-7.




**Figs 1–3:** Maps. **1** – Europe showing the position of the locality Závada in NE partt of the Czech Republic (solid red rectangle); **2** – vicinity of Hlučín town, with position of the sandpit Závada (red circle); **3** – aerial view of the sandpit Závada with position of two occurrence spots of *Tetanops myopina* (red circles, No. 1 and No. 2). Map sources: Fauna Europaea (Fig. 1) and www.mapy.cz (Figs 2, 3).

## Locality

The sandpit Závada (grid mapping code 6074) belongs to the exploitation area Vřesina being situated southerly to the road connecting the villages Vřesina and Bohuslavice (Fig. 2) near Hlučín town in the NE part of the Czech Republic (the Czech Silesia) (Fig. 1). The extraction of sand in this locality is performed by single-berm cross-section (Fig. 11) of the roughly north-south direction (Fig. 3) between the points 49°56.380N 18°09.820E and 49°56.285N 18°09.855E (Matýsek & Jirásek 2014). The bedrock of the sand deposit is formed by culm sediments of the Hradec-Kyjovice group of strata. Above them there are Miocene sediments of the Carpathian foreland basin and glacigenous sediments of the Elsterian glaciation. The main deposit is formed by a complex of greyish yellow and yellowish rusty sands with irregular lenses of polymictic gravel and with larger solitary clasts of erratic origin (erratic boulders). The clay dirt beds are uncommon and of maximum depth of a few decimetres (Matýsek & Jirásek 2014). The sands of the deposit have been interpreted as glaciolacustrine sediments of ice marginal lakes (Růžičková *et al.* 2001) of the Saale Glacial Stage. Their bed depth reaches here up to several tens of metres but the extraction of the sand is limited by the altitude 255 m a. s. l. because of the occurrence of phreatic water. The roof of the deposit is formed by Pleistocene loess loams and the Holocene soil horizon (Matýsek & Jirásek 2014).

## Results

### *Tetanops* (*Tetanops*) *myopina* Fallén, 1820

(Figs 4, 7–9)

**Material examined:** CZECH REPUBLIC: N Moravia: Závada nr. Hlučín 1.6 km S, 49°56'25"N, 18°09'56"E, 265 m, sand-pit, NW part, sweeping sparse vegetation on sand, 9.vii.2013, 2♂, 17.vii.2013, 8♂3♀; Závada nr. Hlučín 2 km S, 49°56'09"N, 18°10'04"E, 270 m, sand-pit, SW part, sweeping sparse vegetation on sand, 17.vii.2013, 3♂1♀, all J. Roháček leg. et det. (deposited in SMOC, several specimens photographed alive).

**Biology and habitat association:** The association of *T. myopina* with the shore dune ecosystem (e.g. Spungis 2002; Kameneva 2008; Howe 2010; Lutovinovas & Petrašiūnas 2013) is well known. However, only Kabos & van Aartsen (1984) provided more detailed information about the biology of this species. According to their study *T. myopina* is strongly xerophilous. Adults preferably hide close to roots of the Marram grass *Ammophila arenaria* (L.) Link and seldom fly. Their greyish dull appearance (as often seen in xerophilous and sand-loving Diptera) makes them well camouflaged on sandy ground. The flies are resistant to drought and strong winds. Their larvae live in stems of *Ammophila arenaria* and probably also in stems of other xerophilous grass species and the adults occur in June and August (in the Netherlands). The Marram grass is also known to be the host plant of *T. myopina* on yellow dunes in Great Britain (Howe 2010).

In the here treated inland locality (sandpit Závada, see material examined, Fig. 11) the first two males of *T. myopina* were collected by chance in spot 1 (see Fig. 3) on June 9th, 2013 when sweeping among sparse vegetation growing on sand (Fig. 10). Because these two specimens were mixed among more numerous adults of *Sphenella marginata* (Fallén, 1814) (Tephritidae) (P. Heřman det.) occurring on *Senecio viscosus* also growing there, they were recognized only on the next day in the laboratory when mounting the material collected. As and when Elena Kameneva kindly confirmed that they really belong to *T. myopina* a special field trip was undertaken to this locality on June 17th, 2013 to collect more specimens and to recognize their microhabitat. Although the species was searched for in the entire area of the sandpit (including recultivated parts with young pine wood) covering about 1 $km^2$ (see Figs 3, 11) the additional adults were only found on two spots (Fig. 3) close to the sand extraction line. The microhabitats in both these spots are characterized by dry, fine and loose sand in which some sparse grasses, mainly *Calamagrostis epigejos* (L.) Roth, grew (Figs 5, 6, 10). The looseness of the sand was in spot 1 due to heaping a fine (sifted) sand from extraction (Figs 6, 10), in spot 2 because a small heap of fine sand was disturbed by wheels of all-terrain vehicles (Fig. 5). In both microhabitats the adult flies were very rarely seen on the sand surface; most specimens were collected by netting blindly around grasses close to the sand surface.

**Behaviour of adults:** Although only a few specimens were seen directly in field (see above) some behaviour of captured adults was observed during their photography in glass boxes in which some gravel and grass stems were arranged. Practically all adults held in the boxes were attracted to small drops of honey-water solution arranged on stems (Figs 7, 8), so imitating honey dew of aphids living in grasses. After being fed, the flies usually rested on gravel or stems and cleaned their mouthparts and fore legs (Fig 4). Several males had attempted to copulate with the single female in the box and the most successful male mated with her for more than 15 minutes (see Figs 7–9), during which time the female continued to suck on a honey drop (Fig. 7).

**Distribution:** Following its biology and habitat requirements the species is generally distributed in coastal areas of the Irish, North and Baltic Seas and partly the Atlantic Ocean as summarized in Fauna Europaea by Kameneva & Greve-Jensen (2013), viz. Ireland, Great


**Figs 4–5:** *Tetanops myopina* (Fallén) and its habitat. **4** – male *T. myopina* (in lateral view) resting on small pebble; **5** – habitat of *T. myopina* at occurrence spot No. 2, small heap of fine sand disturbed by vehicles. Photo by J. Roháček.




**Figs 6–8:** *Tetanops myopina* (Fallén) and its habitat. **6** – close-up of the habitat of *T. myopina* at occurrence spot No. 1, large heap of sifted sand overgrown by sparse grass *Calamagrostis epigejos*. **7** – mating pair of *T. myopina* on grass stem, lateral view; **8** – same, with another male on stem. Photo by J. Roháček.

Britain, France, Belgium, The Netherlands, Germany, Denmark, Norway, Sweden, Finland, Poland, Lithuania, Latvia, Estonia but also in the northwestern part of European Russia (Saint Petersburg vicinity – Hennig 1939; Kameneva 2008). However, besides this main area, there are also records, although scarce, from inland Europe, in Austria and northern Ukraine. While the old Austrian records (Schiner 1864) originating from Wels and Mühlviertel in Oberösterreich could be based on misidentified or mislabelled specimens because these localities are situated in areas lacking habitat of the species, the records from Ukraine (Jaroszewski 1876; Kameneva & Korneyev 1986; Kameneva 2008) are reliable, originating from sandy shores of rivers or lakes, and also confirmed recently (Kameneva 2008). The above first records from the Czech Republic originate from inland sandpit situated in NE part of the Czech Republic (Fig. 1) in the region called Hlučínsko.

**Discussion and conclusions**

**(1) Additions to the fauna of Diptera of the Czech Republic.** The genus *Tetanops* Fallén, 1820 and its species *T. myopina* Fallén, 1820 are new additions to the Czech fauna of the family Ulidiidae which thus now includes 11 genera and 29 species: 10 genera and 27 species of Ulidiidae are listed from the Czech Republic by Roháček (2009), one species, viz., *Homalocephala albitarsis* Zetterstedt, 1838, has subsequently been recorded by Roháček (2012) and the remaining one genus and species are added here.

**(2) Biogeography.** The new record of *T. myopina* from the Czech Republic is important also from the biogeographical point of view because it represents one of a few inland occurrences of this sand-lowing species. The inland records from northern Ukraine (summarized by Kameneva 2008) largely originate from sandy habitats at shores of the Dnipro (Dnieper) River. On the other hand, the population found in the sandpit Závada occurs in a site situated rather far from rivers, about 11 km SE from the larger (upstream of) Odra River and 5 km SW from its smaller tributary, the Opava River, both of which currently do not have sandy banks in this area. Larger but rather gravel than sandy shores can be found about 12.5 km E from Závada sandpit at the Odra river in the protected area called Meandry Odry on the boundary with Poland. The record of *T. myopina* from the NE Czech Republic is a new southwesternmost occurrence limit of the species if the old records from Austria (Schiner 1864) are not taken into account (possible unreliability, see above).

**(3) Inland habitat of *T. myopina* in the sandpit Závada.** The population of *T. myopina* in the sandpit was found to inhabit only two small spots (each of less than 100 $m^2$), with a microhabitat obviously most resembling its preferred seashore dune ecosystem. The most important proved to be the presence of fine and loose sand through which larger grasses grow (Fig. 6). Because the Marram grass *Ammophila arenaria*, the host plant of larvae of *T. myopina* in coastal dunes, is completely absent in inland Central Europe, the species obviously had to use stems of another grass here for larval development (as Kabos & van Aartsen 1984 presupposed). The bushgrass *Calamagrostis epigejos* seems to be the most probable host plant of *T. myopina* in the sandpit Závada but in other inland localities (e.g. on shores of the Dnieper River in Ukraine) some other larger grasses can serve this purpose. Spungis (2002) notes that besides *Ammophila arenaria* also other grasses, including *Calamagrostis epigejos* and *Agrostis stolonifera*, grow on seashore foredunes and that *T. myopina* belongs to the phytophagous consumers of these grasses. Interestingly, *T. myopina* is known to serve as a prey to the coastal tiger beetle *Cicindela maritima* Dejean, 1822 (Lindroth 1998; Spungis 2002); also this can be similar to the situation in the sandpit Závada


**Figs 9–11:** *Tetanops myopina* (Fallén), its habitat and locality. **9** – mating pair of *T. myopina* on grass stem, dorsal view. **10** – habitat of *T. myopina* at occurrence spot No. 1 and its vicinity. **11** – general view of the sandpit Závada from the east. Photo by J. Roháček.

where two species of these predaceous beetles, viz. *Cicindela hybrida* Linnaeus, 1758 and *Cilindera arenaria* (Füssli, 1775), occur commonly (Týn 2013) and were noted in both spots under study.

**(4) Origin of the inland population of *T. myopina* in the sandpit Závada near Hlučín.** In this area *T. myopina* is clearly associated with sands deposited in consequence of the Saalian glaciation. According to Růžičková *et al.* (2001) these sand layers most probably are glaciolacustrine sediments of ice marginal lakes. Considering this fact and the presence of the Odra River in the vicinity (flowing about 11 km from here) we can discuss two hypotheses explaining the origin of the local population of *T. myopina*. (A) The species occurred here since the largest (Saalian = Odralian) Glaciation (cca 160 000 ya, cf. Nývlt *et al.* 2011) on sands originally formed on shores of marginal lakes of the continental glacier after the glacier recession, and survived here also the regression of these lakes. This presupposes that the originally northern *T. myopina* populations were expelled by the glacier growing up to its southernmost borderline lying in the area under study and remained there (first on ice lake shores) up to the present. (B) The species originally lived not only on seashores of Baltic Sea but also on sandy habitats along large rivers that emptied to it, and could therefore also reach along the Odra River to the NE Czech Republic. Subsequently, all the populations along these rivers would have had to become extinct, leaving only the relict ones on glacial sand.

However, the occurrence of *T. myopina* along the Dnieper River and its tributaries in northern Ukraine (Kameneva 2008) and its absence in more southern areas of the Dnieper basin including the Dnieper mouth (E. P. Kameneva & V. A. Korneyev, pers. communication, 2015) speaks against the hypothesis B, because this river flows southerly to the Black Sea. On the other hand, during the Oka and Dnieper Glaciations (the latter timely as corresponding with the Saalian Glaciation in Central Europe, see Matoshko 2011) the glacier reached northern parts of Ukraine so that the inland populations of *T. myopina* resident there on sand dunes can also have a Baltic origin and reached the area during these glaciations as the scenario of the hypothesis A presupposed. The sand dunes in northern Ukraine, especially on the left bank of Dnieper River, from Desna to Seim, originate from sands formed in the lakes between melting glacier, at one side, and Podolian Highland and Donets Ridge at another side; the glacier reached here 48°N, which is believed to be the possible southern boundary of *T. myopina* in Ukraine (E. P. Kameneva & V. A. Korneyev, pers. communication, 2015).

If the hypothesis A is correct it can be expected that some additional relict populations of *T. myopina* could also be found on sand of the glacial origin in other localities near the borders of the Saalian Glaciation not only in the Czech Republic but also in Germany, Poland or Byelorussia.

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**_Tetanops myopina_ Fallén, 1820, psamofilní druh čelnice z podčeledi Otitinae (Diptera: Ulidiidae) nalezený v pískovně v severovýchodní části České republiky**

Čelnice *Tetanops myopina* Fallén, 1820 (Diptera: Ulidiidae) je poprvé ohlášena z území České republiky a to na základě série exemplářů nalezených v činné pískovně Závada u Hlučína (kvadrát síťového mapování 6074). Protože *T. myopina* je v podstatě přímořským druhem, který normálně žije na pobřežních pískových dunách u Irského, Severního a Baltského moře a (částečně: Irsko, Wales) u pobřeží Atlantiku, je tento překvapivý nález uprostřed střední Evropy podrobně pojednán, včetně charakteristiky mikrobiotopu, na kterém se druh v pískovně vyskytoval, s diskusí jeho bionomie a biogeografie a prezentovány hypotézy o možném

historickém původu této vnitrozemské populace. Zdá se, že populace druhu *T. myopina* přežívající na glaciálních píscích v České Republice (i na Ukrajině) jsou pravděpodobně reliktního původu z doby Saalského zalednění.

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