

NEW FAUNISTIC RECORDS OF MOSQUITO *CULISETA GLAPHYROPTERA* (SCHINER, 1864) FROM SUBTERRANEAN HABITATS IN EASTERN SLOVAKIA

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ABSTRACT

In this paper, we present the findings of 14 females *Culiseta glaphyroptera* (Schiner, 1864) in six Slovak caves. The issue of species abundance / rarity in Slovakia is discussed in relation to new knowledge on distribution of *Cs. glaphyroptera* in neighbouring countries.

KEYWORDS

Diptera, Culicidae, rare species, Western Carpathians, subterranean shelters, distribution

INTRODUCTION

The mosquitoes (family Culicidae) are at the centre of worldwide entomological research due to their importance as vectors of a wide range of debilitating viral and parasitic diseases affecting both humans and animals (BECKER et al., 2010). For this reason, Culicidae belongs to one of the most studied dipteran families in Slovakia as well as abroad (e.g. ORSZÁGH et al., 2001, 2009; ORSZÁGH, 2004; BOCKOVÁ et al., 2013). Knowledge of their ecosystem function and conservation status are still, however, very scarce (TÖRÖK et al., 2020). At present, there are 55 species of mosquitoes known in Slovakia (e.g. ORSZÁGH et al., 2001, 2009; ORSZÁGH, 2004; STRELKOVÁ & HALGOŠ, 2012; BOCKOVÁ et al., 2013; BLAŽEJOVÁ et al., 2018; OBOŇA et al., 2020). The mosquito *Culiseta glaphyroptera* (Schiner, 1864) represents one of the rarest species of the above family being currently considered a vulnerable species in Slovakia (JEDLIČKA & STLOUKALOVÁ, 2001). Very little is still known about the life cycle and ecology of *Cs. glaphyroptera*. The larvae of *Cs. glaphyroptera* undergo development in semi-shaded and cool breeding sites. They are commonly found in the riverbeds of small mountain streams with a high content of organic detritus (fallen leaves in particular), or even in the litotelmis that occasionally occur on the large rocks along streams after spring floods (e.g. BECKER et al., 2010). The larvae can be observed until the end of autumn (approximately the end of November) when the cycle of species reproduction ceases. During this period, adults of *Cs. glaphyroptera* (Fig. 1) begin to seek subterranean shelters, such as shallow caves, mines, or cellars, where they hibernate throughout winter. It is assumed that the females feed on blood sucking from birds or small mammals living in forest habitats. *Cs. glaphyroptera*

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is widespread across the mountains of central and south-eastern Europe (BECKER et al., 2010). There are some discrepancies in the knowledge of *Cs. glaphyoptera* distribution in Slovakia. MINÁŘ & HALGOŠ (1997) listed the species at six sites, while ORSZÁGH et al. (2001) and ORSZÁGH (2004) stated *Cs. glaphyoptera* from seven mapping quadrants in the following mountain ranges: Malá Fatra Mts., High Tatras Mts., Belianske Tatras Mts., Slovak Paradise Mts., Vihorlat Mts. and Štiavnické vchy Mts. The occurrence of *Cs. glaphyoptera* in subterranean environment has been documented in several European countries (KOŠEL, 1999, 2004; TÓTH & KENYERES, 2012; DVOŘÁK, 2012, 2014; TÖRÖK et al., 2018; DVOŘÁK & WEBER, 2019).



Figure 1. A hibernating female of *Culiseta glaphyoptera* (photo: Jaromír Bartoš).

MATERIAL AND METHODS

Samples of *Cs. glaphyoptera*, published in this paper, come from several shallow caves (the total length of the cave corridors rarely exceeds 110 m) formed in two small karst areas near the villages of Malá Lodina (the karst area is often referred to as the Ružín Karst) and Veľký Folkmar (the Karst of the Bujanovské vrchy Hills) in eastern Slovakia (Čierna hora Mts., Western Carpathians). Specimens of diverse nematoceran Diptera were collected during winter 2019–20 on the cave walls (Fig. 2) using fine entomological tweezers and fixed in 96% ethyl alcohol. Subsequently, in the laboratory, we sorted the members of Culicidae family out of the collected dipteran material and *Cs. glaphyoptera* were morphologically identified using the determination key by MASLOV (1989).

In the below review of published data on *Cs. glaphyoptera*, for each site, we state an abbreviation of the geomorphological unit which particular site belongs to, i.e. BU – Busov Mts., ČH – Čierna hora Mts., MF – Malá Fatra Mts., SP – Slovak Paradise, ŠT – Štiavnica Mts., TA – Tatra Mts. and VI – Vihorlat Mts. We use the same abbreviations in the list of Material examined and in Fig. 3. In addition, at each site in the review, we indicate a developmental stage of the mosquitoes, i.e. lar. – larva/e, pup. – pupa/e, ims. – imago/es recorded in summer, imw. – imago/es recorded in winter.

As regards new examined material of *Cs. glaphyoptera*, we arranged data for each collected site as follows: cadastral territory, grid mapping codes of the Databank of

the Slovak fauna (DFS) in square brackets [], locality, cave entrance altitude (m a.s.l.), date, collectors, specimen number.



Figure 2. Collecting nematoceran Diptera hibernating on a cave wall (photo: Lubomír Kováč).

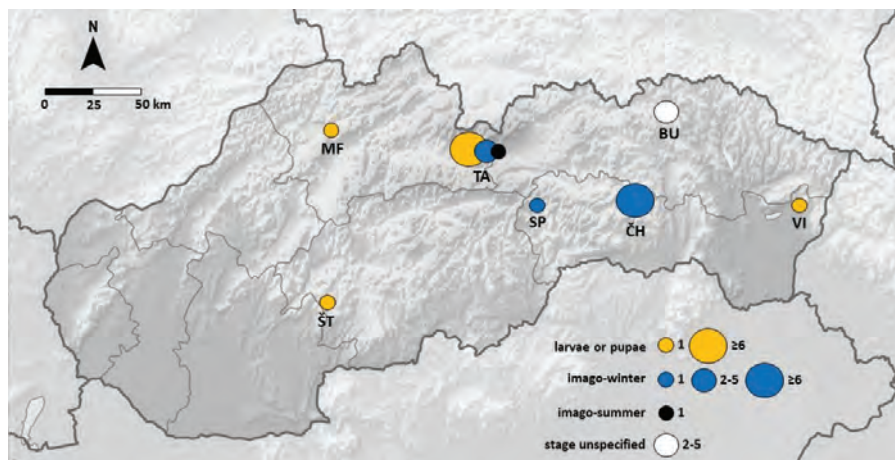


Figure 3. Hitherto known distribution of *Culiseta glaphyoptera* in Slovakia based on published data and new findings. Different circle diameters indicate the number of sites within the geomorphological units where the species was found. Different colouring of the circles indicates developmental stage of the mosquitoes. The full names of abbreviated geomorphological units are provided in Material and methods. (Orig.: Michal Rendoš).

RESULTS

Review of published data

Hereinafter, we present all available published data on *Culiseta glaphyroptera* (Schiner, 1864) from Slovakia:

EDWARDS (1921): Bartfa (= Bardejov), BU. TRPIŠ (1955): Tatranská Lomnica, TA, lar. THURZO (1955): Počúvadlo, ŠT, lar. MIHÁLYI (1959): Bártfa (= Bardejov), BU. TRPIŠ (1960): Tatranská Kotlina, TA, lar. + pup.; Tatranská Lomnica, TA, lar.; Vyšné Hágy, TA, lar.; Štôla, TA, lar.; Štrbské pleso, TA, lar. + pup. TRPIŠ (1965): Vihorlat, VI, lar. LAŠTOVKA (1974): Tatra Mts, TA, lar. + ims. MINÁŘ & HALGOŠ (1997): Varín, MF, lar. KOŠEL (1999): Vlčie Diery Cave, SP, imw. ORSZÁGH et al. (2001): without new records, map of species occurrence in Slovakia provided. KOŠEL (2004): Alabastrová jaskyňa Cave, TA, imw.; Ladová Pivnica Cave, TA, imw. ORSZÁGH (2004): without new records, summary of data published.

Material examined

A total of 14 hibernating females of *Cs. glaphyroptera* were collected in early 2020 in the caves of the Ružín Karst (4 caves) and the Karst of the Bujanovské vrchy Hills (2 caves).

Ružín Kras, ČH: Malá Lodina, [7192], Veľká Ružínska jaskyňa Cave, 614 m a.s.l., 19.1.2020, M. Rendoš; A. Parimuchová, 4 ♀♀. Malá Lodina, [7192], Malá kvapľová jaskyňa Cave, 602 m a.s.l., 19.1.2020, M. Rendoš; A. Parimuchová, 1 ♀. Malá Lodina, [7192], Antonova jaskyňa Cave, 600 m a.s.l., 19.1.2020, M. Rendoš; A. Parimuchová, 2 ♀♀. Malá Lodina, [7192], Hadia jaskyňa Cave, 580 m a.s.l., 19.1.2020, M. Rendoš; A. Parimuchová, 2 ♀♀. **Karst of the Bujanovské vrchy Hills, ČH:** Veľký Folkmar, [7192], Predná Veľká jaskyňa Cave, 400 m a.s.l., 29.2.2020, M. Rendoš; A. Parimuchová, 2 ♀♀. Veľký Folkmar, [7192], Úkrytová jaskyňa Cave, 636 m a.s.l., 29.2.2020, M. Rendoš; A. Parimuchová, 3 ♀♀.

Note: *Culiseta annulata* (Schrank, 1776), species closely related to *Cs. glaphyroptera*, was found in Antonova jaskyňa Cave 4 ♀♀; Hadia jaskyňa Cave 11 ♀♀; Predná Veľká jaskyňa Cave 9 ♀♀ and Úkrytová jaskyňa Cave 1 ♀.

DISCUSSION

In several Central European countries, *Culiseta glaphyroptera* is considered a rare mountain species. This is, for instance, the case of Hungary (TÓTH & KENYERES, 2012; TÖRÖK et al., 2018), Germany (KAMPEN et al., 2013), Austria (W. LECHTHALER, pers. comm.), and Poland (WEGNER, 1991; KUBICA-BIERNAT, 1999).

Cs. glaphyroptera has been included into the red list of threatened animals of the Czech Republic classified as “vulnerable species” (VU) and is considered one of the seven rarest mosquito species (MINÁŘ, 2005). However, DVOŘÁK (2012, 2014) implied, after examining a large number of subterranean shelters, that *Cs. glaphyroptera* seems to be relatively common and widespread mosquito, at least in western part of the

country. *Cs. glaphyoptera* was similarly included into the Slovak red list as one of four vulnerable Diptera (JEDLIČKA & STLOUKALOVÁ, 2001). In the latest catalogue of Slovak mosquitoes, ORSZÁGH (2004) reported the occurrence of this mosquito species in several localities. Since then, no new records on *Cs. glaphyoptera* have been published from Slovakia.

Except for the above mass occurrence of *Cs. glaphyoptera* in the Czech Republic DVOŘÁK (2012, 2014), there are other recent records of the species from subterranean habitats in several Central as well as West European countries, specifically Hungary (TÖRÖK et al., 2018), Erz Mts. in eastern Germany, Allgäu region in southern Germany (KAMPEN et al., 2013) and Rhineland-Palatinate in western Germany (DVOŘÁK & WEBER, 2019). On the contrary, no specimen was found during the research of mosquitoes in similar habitats in Austria (ZITTRA et al., 2019).

CONCLUSIONS

There are only few records of *Cs. glaphyoptera* known from Slovakia. This indicate that the species occurrence is presumably rare on its territory. The rarity of *Cs. glaphyoptera* is supported by practically all previous foreign studies focused on the mosquito summer occurrence.

A systematic research carried out recently in subterranean habitats revealed *Cs. glaphyoptera* to be common in the Czech Republic (DVOŘÁK, 2012, 2014), but rather rare in Austria (ZITTRA et al., 2019). So far, similar research has been carried out neither in Slovakia, nor in its neighbouring countries (Poland, Hungary, Ukraine). Therefore, we assume more comprehensive research into subterranean habitats (caves, galleries, cellars, bunkers) could clarify whether *Cs. glaphyoptera* is a rare mosquito species in Slovakia or, conversely, it is common and widespread.

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