

DATA ON THE BITING MIDGES OF THE GENUS *CULICOIDES* LATREILLE (DIPTERA: CERATOPOGONIDAE) IN LABANORAS REGIONAL PARK (EASTERN LITHUANIA)

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Introduction

Culicoides (Diptera: Ceratopogonidae) are small bloodsucking dipterous insects, belonging to the infraorder Culicomorpha. They are known for transmitting arboviruses, bacteria, protozoans and helminth parasites of humans, animals and birds (Valkiūnas, 2005; Carpenter *et al.*, 2013). Knowledge on the *Culicoides* ecology, abundance and species composition in the region is of great importance in predicting the epidemiology of transmitted pathogens as well as for planning future research on this matter. The genus *Culicoides* presently includes 1 347 valid species worldwide (Borkent & Dominiak, 2020) and twenty-seven of them are known from Lithuania so far (Pakalniškis *et al.*, 2006). The aim of this study was to elucidate the diversity of *Culicoides* biting midges in Labanoras Regional Park, the area is known from local residents for the extremely high abundance of these insects in Lithuania.

Material and Methods

Biting midges were collected in 2017–2020 by entomological nets, Onderstepoort black light trap as well as from the person (biting midges were collected from a handbreadth covered by gloves) using a potter. Collecting was performed several days each year in June and July from the 7 pm to 11 pm, as it is known that the highest activity of midges is at dusk (Glukhova, 1989). Material was identified in the Laboratory of Entomology, Nature Research Centre under Olympus SZX10 (Olympus, Tokyo, Japan) binocular stereoscopic microscope using morphological features (Glukhova, 1989; Mathieu *et al.*, 2012). Several insects from each morphologically identified species were examined using PCR-based methods in order to confirm identification; this was done using the primers LCO1490 and HCO2198 that amplify a fragment of cytochrome oxidase subunit I (*COI*) of mitochondrial DNA (Folmer *et al.*, 1994). The material is deposited in Nature Research Centre, Laboratory of Entomology.

List of localities

Locality	Administrative district	Coordinates (LAT, LONG)
Juodynėlis	Švenčionys district	55.207024, 25.923893
Labanoras	Švenčionys district	55.267283, 25.773514
Pašekštis	Švenčionys district	55.239683, 25.812868

List of species

Culicoides (Avaritia) chiopterus (Meigen, 1830)

Juodynėlis, 14 06 2017, 3♀, 13 06 2018, 4♀, 11 06 2019, 1♀; Labanoras, 18 06 2017, 1♂2♀ (RB).

Culicoides (Avaritia) obsoletus (Meigen, 1818)

Juodynėlis, 14 06 2017, 4♀, 13 06 2018, 2♀, 15 06 2018, 2♂, 11 06 2019, 1♂5♀, 15 07 2020, 2♀; Labanoras, 21 06 2017, 2♀; Pašekštis 12 06 2017, 1♂ (RB).

Culicoides (Avaritia) scoticus Downes et Kettle, 1952

Juodynėlis, 15 06 2017, 2♂, 15 06 2018, 1♂; Labanoras, 18 06 2017, 1♂ (RB).

Culicoides (Culicoides) fagineus Edwards, 1939

Juodynėlis, 18 06 2017, 2♀, 15 06 2018, 1♀; Labanoras, 21 06 2017, 2♀ (RB).

Culicoides (Culicoides) punctatus (Meigen, 1804)

Juodynėlis, 18 06 2017, 2♀, 20 06 2017, 1♀, 13 06 2018, 3♀, 11 06 2019, 3♀; Labanoras, 18 06 2017, 4♀; Pašekštis 17 06 2017, 1♂2♀ (RB).

Culicoides (Oecacta) albicans Winnertz, 1852

Juodynėlis, 14 06 2017, 2♀, 13 06 2018, 1♀, 15 07 2020, 1♀; Pašekštis 17 06 2017, 1♀ (RB).

Culicoides (Sensiculicoides) kibunensis Tokunaga, 1937

Juodynėlis, 18 06 2017, 2♀, 15 06 2018, 4♀, 15 07 2020, 3♀; Labanoras, 18 06 2017, 2♀ (RB).

Culicoides (Sensiculicoides) pictipennis (Stæger, 1839)

Juodynėlis, 14 06 2017, 3♀, 13 06 2018, 1♀, 11 06 2019, 2♀; Pašekštis 12 06 2017, 1♀ (RB).

Culicoides (Wirthomyia) segnis Campbell et Pelham-Clinton, 1960

Juodynėlis, 15 06 2018, 2♀, 11 06 2019, 1♀, 16 07 2020 2♀; Pašekštis 17 06 2017, 1♀ (RB).

Culicoides (Culicoides) impunctatus Goetghebuer, 1920

This species is the most abundant *Culicoides* species, with the highest numbers observed from the 10th to the 20th of June (2017–2019) and representing from 94% (Labanoras, 18 06 2017) to 99% (Juodynėlis, 15 06 2018) of all collected biting midges. More than 15 000 *C. impunctatus* specimens were collected during this study. We collected up to 34 *C. impunctatus* biting midges on a handbreadth per 1 min. This is the most abundant *Culicoides* species in Labanoras Regional Park in June in all investigated localities. Biting midges of this species were not found in July neither using traps, nor using entomological nets. We have noticed a certain behaviour of this species to accumulate around the beehive, especially nearby the bee entrance (Juodynėlis, 2018–2019). The biting midges seem to want to enter the beehive and the density of midges collected on one handbreadth per 1 min nearby the beehive (28±5) and 100 m away (14±7) at the same hour was different (t test, df=2, p<0,05). This interesting issue requires further investigation.

Discussion

In spite of the fact that abundance of biting midges in June at our study site was high, the diversity of *Culicoides* midges in Labanoras Regional Park was low (Simpson's Diversity index varied between 0,87 and 0,99), because of the absolute dominance of one

Culicoides species. The high abundance of bloodsucking *C. impunctatus* in Labanoras Regional Park in June causes nuisance for local people, livestock and wildlife, has an impact on tourism. On the other hand, this phenomenon provides an opportunity to perform the experimental research as it has already been done in other countries (Žiegytė *et al.*, 2014) or with laboratory reared biting midges (Bukauskaitė *et al.*, 2019).

Culicoides impunctatus is distributed throughout most of the northern Europe, breeding in acidic, boggy ground where *Sphagnum* spp. and *Juncus* spp. are the dominant plants (Blackwell *et al.*, 1992). This species also is known as Scottish biting midge because of the largest numbers found in this country, where it represents between 70–95% of the attacks on humans (Boorman, 1986; Carpenter *et al.*, 2013). This species is also known to be abundant during June–July in Sweden (Ander *et al.*, 2012), in June in Southern England (Service, 1969), Western North Russia (Glukhova, 1989) and Kaliningrad district (Žiegytė *et al.*, 2017). High abundance of this species lies in the ability of adult females to produce the first batch of eggs without taking a blood meal, however, this is required for the development of further batches (Boorman & Goddard, 1970). This is a selectively advantageous trait in areas of low available host density (Carpenter *et al.*, 2013).

The tendency of biting midges to accumulate at the beehive can be explained by the attractiveness of higher temperature or higher concentrations of carbon dioxide by the entrance of beehive. The studied sites represent an important place in Lithuania not only for the study of the biology of *Culicoides* biting midges, but also for the occurrence and transmission of pathogens that they are vectors.

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Duomenys apie *Culicoides* Latreille genties smulkiuosius mašalus (Diptera: Ceratopogonidae) Labanoro regioniniame parke (Rytų Lietuva)*K. VALAVIČIŪTĖ, C. R. F. CHAGAS, R. BERNOTIENĖ***Santrauka**

Culicoides (Diptera: Ceratopogonidae) smulkieji mašalai yra smulkūs kraujasiurbiai vabzdžiai, galintys platinti žmonių ir kitų gyvūnų patogenus. Lietuvoje žinomos 27 *Culicoides* genties smulkiųjų mašalų rūšys. Šiuo tyrimu buvo įvertinta smulkiųjų mašalų įvairovė, gausumas ir dominuojančios rūšys Labanoro regioniniame parke, nes buvo žinoma, kad šioje teritorijoje smulkiųjų mašalų gausumas būna itin didelis. Atlikus tyrimus 2017–2020 metais birželio–liepos mėnesiais nustatyta 10 *Culicoides* genties rūšių, iš kurių itin gausi buvo *Culicoides impunctatus* Goetghebuer, sudarydama nuo 94% (Labanoras) iki 99% (Juodynėlis) visų surinktų smulkiųjų mašalų. Šios rūšies mašalai gausiai skraido antrąjį birželio dešimtadienį, sukelia nepatogumų vietas gyventojams bei gyvūnijai, tačiau šie vabzdžiai gali būti naudojami moksliniuose tyrimuose kaip modelinė rūšis, nes, esant dideliame jų gausumui, galima surinkti pakankamai medžiagos bei atlikti eksperimentinius patogenų transmisijos tyrimus. Pastebėta, kad daugiau smulkiųjų mašalų aptinkama prie bičių avilių, jie būna gausiai nutūpę avilių landas. Šis reiškinys turėtų būti ištirtas plačiau.

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