HAS THE STRUCTURE OF HORSEFLY COMMUNITIES CHANGED IN THE RECENT DECADES?

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Abstract

A study was carried out on an equestrian farm to study the structure of horsefly community near the village of Sántos (Somogy County, South-West Hungary) in 2018. A total of 19,366 horseflies were collected with H-traps. The specimens belonged to 31 species. According to our results, the most dominant species were *Tabanus tergestinus* (24%), *Haematopota italica* (20%), *Tabanus bromius* (15.15%) *Tabanus autumnalis* (10.8%), *Tabanus sudeticus* (7.1%), *Haematopota pluvialis* (5.4%), *Atylotus loewianus* (5.2%) and *Tabanus glaucopis* (4.6%). The proportion of 22 species in the aggregate sample is below 1%. The rarest species include *Tabanus quatornotatus*, *Therioplectes gigas*, *Philipomyia graeca* and *Hybomitra ukrainica*. Comparison of our data with previous results is limited due to the different sampling methods.

Key words: horsefly, Tabanidae, H-trap, insect trap

Összefoglalás

A Somogy megyei Sántoson 19366 böglyöt gyűjtöttünk 2018 május 3. és 2018 szeptember 26. között, H-trap típusú bögölycsapdákkal. A gyűjtött egyedek 31 fajhoz tartoztak. Eredményeink alapján az összesített mintában a terület domináns fajai a következők voltak: *Tabanus tergestinus* (24%), *Haematopota italica* (20%), *Tabanus bromius* (15.15%) *Tabanus autumnalis* (10.8%), *Tabanus sudeticus* (7.1%), *Haematopota pluvialis* (5.4%), *Atylotus loewianus* (5.2%), *Tabanus glaucopis* (4.6%). A további 22 faj aránya 1% alatt maradt. A legritkább fajok közé tartozott a *Tabanus quatornotatus*, a *Therioplectes gigas*, a *Philipomyia graeca* és a *Hybomitra ukrainica* is. Adataink összehasonlítása korábbi eredményekkel csak korlátozottan lehetséges az eltérő mintavételi módszerek miatt.

Introduction

The negative effects of the horseflies are well known. Their female specimens feed on the blood of mammals or humans. Their bites are painful and if present in large numbers in the area, can cause severe blood loss to the animals (Tashiro, 1949). They can spread various diseases (Krinsky, 1976, Foil, 1989, Foil et al. 1991, Foil & Hogsette, 1994), and they are likely to annoy the animals. For the reasons listed above, tabanids could even cause economic damage and livestock farmers should protect their animals against them (Mock 1994).

The control of the horseflies is still an unsolved problem. In recent years, a new, environmentally friendly trap, the H-trap has been expanding. There is not too much information about the operation of the trap, and little is known about its effectiveness (Török et al 2016, Kline et al 2018, Otártics et al. 2019)

However, we do not have any information on how suitable is this trap for ecological sampling. H- trap has not previously been subjected to faunistic studies. The knowledge of the species, their frequency and distribution in the area are the basis for control of the horseflies. The aim of our research was to investigate the horsefly community of an equestrian farm using H-traps and to identify common and rare species in the area.

Material and methods

We started to collect horseflies at Sántos (Somogy County, South-West Hungary), in the Nyargalók Equestrian Farm. The sampling site is located 250 m from the Kapos River, at the edge of a forest spot in Zselic valley where the hills meet the floodplain areas (46°21'17.44"N - 17°52'42.70"E). On the farm, eleven horses were kept, about 4 hectares in horse-pens. Between 03. 05. 2018. and 10. 07. 2018. ten H-trap traps were used and between 15. 07. 2018 and 26. 09. 2018. more five traps were added. The traps were emptied twice a week, every 3-4 days. The collected specimens were determined according to the keys, Chvála et al. (1972), Majer (1987) and Krčmar (2011).

Results and discussion

A total of 19,366 specimen belonging to 31 species were collected during the sampling period (Table 1). Tabanus genus was represented by 12 species, followed by the genera Haematopota (6 species) and Hybomitra (6 species). The amount of the most frequent species exceeded 10%. Tabanus tergestinus (Fig. 1) was collected in the largest percentage (23.95%) that was ensued by H. italica (Fig. 3) (19.99%), T. bromius (Fig. 4) (15.15%) and T. autumnalis (Fig. 2) (10.84%). The proportion of T. sudeticus (7.13%), A. loewianus (5.18%), H. pluvialis (5.37%), T. glaucopis (4.61%) and T. maculicornis (3.45%) were also high. The rarest species were Hybomitra distinguenda (Fig. 8), H. ukrainica, Philipomyia graeca (Fig. 7), and Therioplectes gigas (Fig. 5) with two specimens during the three months of sampling period while the species Tabanus quatornotatus (Fig. 6) was represented with one specimen.

Table 1. List, abundance and proportion of collected species

		abundance	%
1.	*Atylotus loewianus* Villeneuve, 1920	1004	5.18%
2.	*Chrysops caecutiens* (Linnaeus, 1758)	4	0.02%
3.	*Chrysops viduatus* (Fabricius, 1794)	21	0.11%
4.	*Haematopota bigoti* Gobert, 1880	9	0.05%

5.	*Haematopota crassicornis* Wahlberg, 1848	9	0.05%
6.	*Haematopota italica* Meigen, 1804	3871	19.99%
7.	*Haematopota pluvialis* (Linnaeus, 1768)	1040	5.37%
8.	*Haematopota subcyllindrica* Pandellé, 1883	309	1.60%
9.	*Hamatopta ocelligera* (Krober, 1922)	3	0.02%
10.	*Heptatoma pellucens* (Fabricius,1776)	104	0.54%
11.	*Hybomitra bimaculata* (Macquart, 1826)	43	0.22%
12.	*Hybomitra ciureai* (Séguy, 1937)	122	0.63%
13.	*Hybomitra distinguenda* (Verall, 1909)	2	0.01%
14.	*Hybomitra muehlfeldi* (Brauer, 1880)	85	0.44%
15.	*Hybomitra pilosa* (Loew, 1858)	10	0.05%
16.	*Hybomitra ukrainica* (Olsufjev, 1952)	2	0.01%
17.	*Philipomyia graeca* Olsufjev, 1964	2	0.01%
18.	*Silvius alpinus* (Scopoli, 1763)	4	0.02%
19.	*Tabanus autumnalis* Linnaeus, 1761	2099	10.84%
20.	*Tabanus bovinus* Linnaeus, 1758	35	0.18%
21.	*Tabanus bromius* Linnaeus, 1758	2934	15.15%
22.	*Tabanus cordiger* Meigen, 1820	4	0.02%
23.	*Tabanus glaucopis* Meigen, 1820	893	4.61%
24.	*Tabanus maculicornis* Zetterstedt, 1842	668	3.45%
25.	*Tabanus paradoxus* Jaennicke, 1866	44	0.23%
26.	*Tabanus quatornotatus* Meigen, 1820	1	0.01%
27.	*Tabanus spectabilis* Loew, 1858	16	0.08%
28.	*Tabanus spodopterus* Meigen, 1820	6	0.03%
29.	*Tabanus sudeticus* Zeller, 1842	1381	7.13%
30.	*Tabanus tergestinus* Egger, 1859	4639	23.95%
31.	*Therioplectes gigas* (Herbst, 1787)	2	0.01%

Figure 1. T. tergestinus

Figure 2. T. autumnalis

Figure 3. H. italica

Figure 4. T. bromius

Figure 5. Th. gigas

Figure 6. T. quatornotatus

Figure 7. Ph. graeca

Figure 8. Hy. distinguenda

Although many tabanological studies have been conducted in the South Transdanubia region

between 1950 and 2010 (Otártics et al., 2016), it is difficult to compare old and new data. Most articles contain mostly faunistic data with the list of species. Unfortunately, there are only a few studies that include quantitative evaluation based on mass collection. However, the comparison is almost impossible by the fact that the data were collected by different researchers at different sampling points and times, using different methods. Nevertheless, some cautious conclusions can be drawn. In Majer's (1983a, 1985a) researches on "Barcsi borókás", *T. bromius* and *T. tergestinus* species proved to be the most abundant, as we found in Sántos. Unfortunately, the quantitative evaluation was limited to the *Tabanus* genus. Using various collecting methods in "Éger-völgy" (Mecsek mountains), Majer found high proportions of *T. bromius, T. exclusus* and *T. tergestinus* (1983b, 1985b). Quantitative evaluation of the data included only the *Tabaninae* subfamily. *T. maculicornis, T. bromius, H. italica*, and *H. pluvialis* were found in large numbers in material that was collected by Malaise traps and hand net at Abaliget (Majer, 1988). According to Tóth (1996), *H. pluvialis, T. bromius* and *Hybomitra distinguenda* had the highest number of individuals in the material from 14 sampling areas of the Boronka Landscape Protection Area. This material was also collected by several researchers using different methods. Tóth carried out an examination of the horsefly fauna of the Duna-Dráva National Park between 1975 and 1999 (Tóth, 2000). He used two types of Malaise traps and hand net and collected a total of 1,565 specimens of 33 species at 55 different sampling points. According to the quantitative evaluation of the data, about two-thirds of the material consisted of four species: *H. pluvialis* (35.91%), *T. bromius* (14.89%), *H. ciureai* (8.37%) and *T. maculicornis* (6.77%).

A more detailed quantitative evaluation is found in Krčmar's (1999) article, who collected tabanids with Malaise traps and hand net on the Pannonian Plain (Eastern Croatia) between 1992-96. Most of the 13,439 specimens captured were *T. bromius* (24.9%), followed by *H. subcylindrica, H. pluvialis* and *Hy. ciureai*. At Petrijevci, on a grassland, the vast majority of collected 2,867 tabanids belonged to *H. subcylindrica, T. bromius, H. pluvialis* and *Ch. parallelogrammus*, while *T. bromius, T. sudeticus, A. loewianus, T. tergestinus* and *T. maculicornis* were abundant on the Kopački rit (Krčmar, 2005). In one of the very rare H-trap studies data from 8 different sampling sites were processed and *T. bromius, T. tergestinus, H. pluvialis* and *H. italica* species were found to be abundant (Török et al., 2016).

In the cited papers, the quantitative evaluation of the data was based on the relative

frequency of species in the processed material. Based on these, *H. italica, H. pluvialis, H. ciureai, H. distinguenda, T. bromius, T. exclusus, T. maculicornis* and *T. tergestinus*, may be the dominant species of the horsefly communities. The abundance of different tabanid species varies seasonally. According to Hayakawa (1980), based on the seasonal dynamics of abundance, the different species of horseflies can be divided into three groups (spring-early summer, summer, late summer-autumn). According to this, we find other dominant species in a habitat in early summer, mid-summer and early autumn. *Hy. ciureai* and *T. maculicornis* typically fly in high numbers in early summer and disappear by August. In contrast, *H. pluvialis* reaches its peak of abundance in mid-summer.

Vegetation type of habitat may also affect the composition of the tabanid community (Krčmar et al., 2009). In addition, the quantitative ratios of species are influenced by differences in sampling methods, length of sampling period and weather patterns over the years. Nevertheless, some species (*H. pluvialis, T. bromius*) seem to be dominant elements of the community in all studies, regardless of space, time, and methodological parameters.

Despite the numerous studies published so far, there is a lack of knowledge of the structure of tabanid communities. In order to effectively control the horseflies, it is necessary to know the dominant species typical of a given habitat type, their seasonal activity and behavioral characteristics. All this requires further research in the future using standardized methods.

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References

Chvála, M., Lyneborg, L. and Moucha, J. 1972. The Horse flies of Europe (Diptera, Tabanidae). Entomological Society of Copenhagen. E. W. Classey Ltd., Hampton, p 499

Foil, L. D., 1989. Tabanids as vectors of disease agents. *Parasitology Today.* **5**, 88–96.

Foil, L. D., Leprince, D. J. and Byford, R. L. 1991. Survival and dispersal of horse flies (Diptera: 'I'abanidae) feeding on cattle sprayed With a sublethal dose of fenvalerate. *Journal of Medical Entomology.* **28.** 663-667.

Foil, L. D. and Hogsette, J. A. 1994. Biology and control of tabanids, stable flies and horn flies. *Revues Scientifique et Technique de l'Office Internationale des Epizooties.* **13.** 1125-1158.

Hayakawa, H. 1980. Biological studies on Tabanus iyoensis group of Japan, with special reference to their blood-sucking habits (Diptera, Tabanidae). *Bulletin of the Tohoku National Agricultural Experiment Station.* **62.** 131–321.

Kline, D. L., Hogsette, J. A. and Rutz, D. A. 2018. A comparison of the Nzi, Horse Pal® and Bite-Lite® H-traps and selected baits for the collection of adult Tabanidae in Florida and North Carolina. *Journal of Vector Ecology*. **43(1).** 63-70.

Krčmar, S. 1999. Seasonal dynamics of horse flies in Eastern Croatia as a part of the Pannonian Plain (Diptera: Tabanidae). *Periodicum Biologorum.* **101(3).** 221 -228.

Krčmar, S. 2005. Seasonal abundance of horse flies (Diptera: Tabanidae) from two locations in eastern Croatia. *Journal of Vector Ecology.* **30(2).** 316-321.

Krčmar, S., Mikuska, A. and Jaslka, M. 2009. Horsefly Fauna of three different Forest communities in the Danube river Floodplain in Croatia (Diptera: Tabanidae). *Entomologia Generalis.* **32(1).** 023-034.

Krčmar, S.,. Hackenberger, D. K. and. Hackenberger B. K. 2011. Key to the horse flies fauna of Croatia (Diptera, Tabanidae). *Periodicum Biologorum.* **113.** 5-33.

Krinsky, W. L. 1976. Animal disease agents transmitted by horse flies and deer flies. *Journal of Medical Entomology.* **13.** 225-275.

Majer, J. 1983a. Adatok a Barcsi borókás Tabaninae (Diptera) faunájához. *Dunántúli Dolgozatok Természettudományi Sorozat.* **3.** 83-88.

Majer, J. 1983b. Pécs, Éger-völgy Tabaninae faunája (Diptera). A *Janus Pannonius Múzeum Évkönyve.* **27(1982).** 51-56.

Majer, J. 1985a. Adatok a Barcsi Borókás Chrysopinae és Tabaninae (Diptera) faunájához. *Dunántúli Dolgozatok Természettudományi Sorozat.* **5.** 135-138.

Majer, J. 1985b. Adatok Pécs, Éger-völgy Tabanidae (Diptera) faunájához. *A Janus Pannonius Múzeum Évkönyve.* **29(1984).** 49-52.

Majer, J. 1987. Tabanidae fajok gazdapreferenciájának vizsgálata állatkertben. (Investigation of host preference of Tabanidae species in a zoo.). *Állattani Közlemények.* **74.** 89–95.

Majer, J. 1988. Adatok Abaliget Tabanidae és Stratiomyidae (Diptera) faunájához. *A Janus Pannonius Múzeum Évkönyve.* **32(1987).** 25-28.

Mock, D. 1994. Fly Feed: Horses. *Journal of Equine Veterinary Science.* **14.** 392–393.

Otártics, M. Zs., Török, H. K., Barna, R., Böndi, B., Strausz, Sz. and Farkas, S. 2016. A Dél-Dunántúl bögöly faunájáról (Diptera: Tabanidae). *Natura Somogyiensis.* **28.** 5-16.

Otártics, M. Zs., Altbäcker, V., Solymosi, K., Mátics, R., Romvári, R. and Farkas, S. 2019. Efficacy of H-traps is affected by exposure to sunshine. *Natura Croatica.* **28.** 257–269.

Tashiro, H. and. Schwardt, H.H. 1949. Biology of the Major Species of Horse Flies of Central New York. *Journal of Economic Entomology*. **2.** 269-272.

Tóth, S. 1996. Adatok a Boronka-melléki Tájvédelmi Körzet bögöly és katonalégy faunájához (Diptera: Tabanidae, Stratiomyidae). *Somogy Megyei Múzeumok Közleményei.* **12.** 263-267.

Tóth, S. 2000: Adatok a Duna-Dráva Nemzetei Park bögöly faunájához (Diptera: Tabanidae). – *Somogy Megyei Múzeumok Közleményei.* **14.** 331-341.

Török, H. K., Otártics, M. Zs., Tóth, S., Barna, R., Mátics, R., Kazinczi, G., Pál-Fám, F. and Farkas, S. 2016. Polarizációs csapdákkal, legelőkön gyűjtött bögöly (Tabanidae) közösségek elemzése [Analysis of horsefly communities of pastures sampled by polarization traps] *In: Nagy, Z. B. (szerk.) LVIII. Georgikon Napok: Felmelegedés, ökolábnyom, élelmiszerbiztonság.* – Keszthely, Magyarország: Pannon Egyetem Georgikon Kar. pp. 384-392.