

HORSEFLY FAUNA (DIPTERA: TABANIDAE) OF GORSKI KOTAR, CROATIA

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During the 1992-1998 and 2000-2002 period a total of 1397 horseflies, representing 28 species of the genera *Silvius*, *Chrysops*, *Atylotus*, *Hybomitra*, *Tabanus*, *Heptatoma*, *Haematopota* and *Philipomyia*, were collected in the Gorski kotar region, Croatia. *Tabanus* is the most common genus, represented by 13 species, followed by the genera: *Hybomitra* - 5 species, *Chrysops* - 3, *Haematopota* and *Philipomyia* - 2, and *Silvius*, *Atylotus* and *Heptatoma* with 1 species each. The most abundant species is *Tabanus bromius*, accounting for 59.98%, followed by *Tabanus glaucopis*, 12.52%, *Tabanus maculicornis*, 6.08% and *Philipomyia aprica* at 4.15%. These four species make up 82.73% of the horsefly fauna in the Gorski kotar. Seven new horsefly species were sampled for the study area. The collected species cover 14 fields on the UTM grid of Croatia.

Tabanidae, Diptera, fauna, Gorski kotar, Croatia

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U razdoblju od 1992. do 1998. i 2000. do 2002. godine na području Gorskoga kotara u Hrvatskoj uzorkovano je ukupno 1397 obada svrstanih u 28 vrsta, te u rodove *Silvius*, *Chrysops*, *Atylotus*, *Hybomitra*, *Tabanus*, *Heptatoma*, *Haematopota* i *Philipomyia*. Rod *Tabanus* najbrojniji je s 13 vrsta, slijede rodovi: *Hybomitra* s 5 vrsta, *Chrysops* s 3 vrste, *Haematopota* i *Philipomyia* s 2 vrste, *Silvius*, *Atylotus* i *Heptatoma* s 1 vrstom. Najbrojnija je vrsta *Tabanus bromius* s 59,98 %, slijedi *Tabanus glaucopis* s 12,52 %, *Tabanus maculicornis* sa 6,08 % i *Philipomyia aprica* s 4,15 %. Te četiri vrste čine 82,73 % faune obada na području Gorskog kotara. Sedam vrsta obada su nove vrste u fauni istraživanoga područja. Uzorkovane vrste pokrivaju 14 polja na UTM mreži Hrvatske.

Tabanidae, Diptera, Gorski kotar, Hrvatska

Introduction

Horseflies are known worldwide as important mechanical vectors of viruses, bacteria, protozoans and helminthes, which can cause diseases in wild and domestic animals (Foil, 1989). Species abundance and distribution of horseflies have been recently reported from the Mediterranean part (Krčmar & Leclercq, 1997; Krčmar, 1999; Krčmar & Durbešić, 2001; Krčmar et al. 2003) and from the lowland inland part of Croatia (Krčmar & Matsumura, 1996; Krčmar & Leclercq, 1999; Krčmar & Mikuska, 2001). However, there is only one recent study from the Gorski Kotar or mountain region of Croatia (Krčmar & Mikuska, 1998). Additionally, some sporadic information on the horsefly fauna of this region can be found in articles by foreign entomologists who collected them during short study tours (Danielova, 1961; Moucha, 1965). Lack of data about horsefly fauna in the mountainous region of Croatia is the main reason prompting us to start systematic research in Gorski kotar. In this article we present data on the horsefly fauna of Gorski kotar sampled during the 1992-1998 and 2000-2002 periods.

Materials and methods

Periodical samplings were carried out on 28 localities of Gorski kotar from 1992 to 1998 and from 2000 to 2002. Sampling localities were located largely near forests at altitudes ranging from 200-1400 meters above the sea level, and covering 14 UTM squares of Croatia (Figure 1). Gorski kotar is a mountain region of Croatia. It is surrounded by the mountains Kapela, Klek, Risnjak, Snježnik, Bjelolasica and the rivers Kupa, Čabranka and Dobra. The area of Gorski kotar covers some 2000 square kilometers and this area is the rainiest area in Croatia.

The female horseflies were primarily collected by sweep net on horses or by hand in a car. Males were collected only by sweep net on the humid soil of forest paths or on sunlit electric pylons 60 cm above ground. Samplings were made at monthly intervals from June to September, during the horsefly flight season. Collected horseflies were stored in 70 % alcohol, and only later dried and pinned. All collected horseflies are stored in the insect collections of the Department of Biology, University of Osijek. Identification and nomenclature followed that of Chvála et al. (1972), Majer (1987) and Chvála (1988).

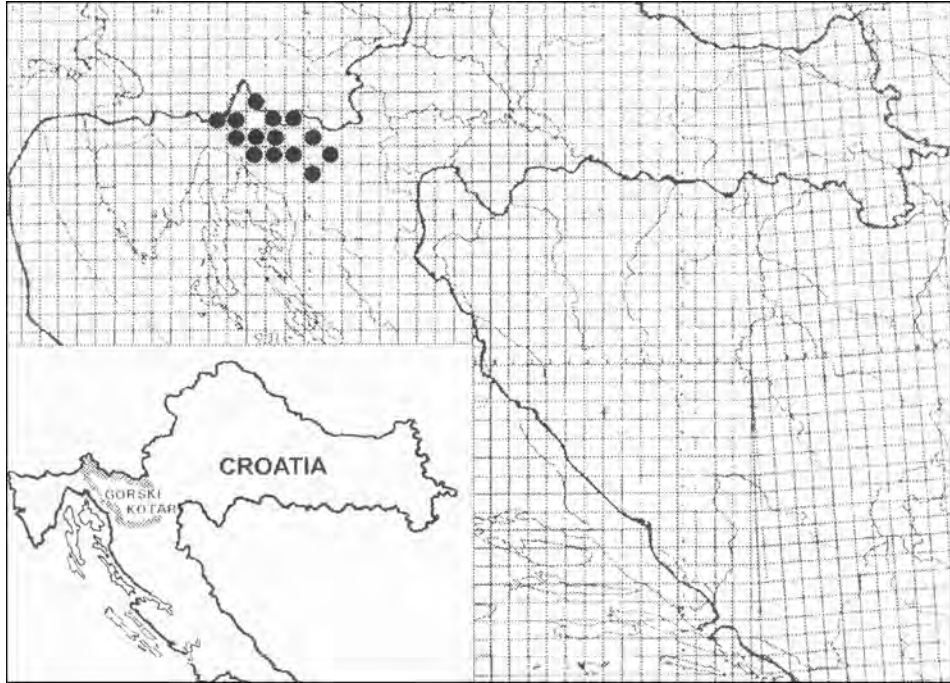


Figure 1 Collecting localities of horseflies shown on the UTM grid in Croatia

Results

During the study periods, a total of 1397 specimens of horsefly, representing 28 species, were collected in Gorski kotar (Table 1 and 2). The most numerous is the genus *Tabanus* with 13 species, while the other genera are represented as follows: *Hybomitra* with 5 species, *Chrysops* 3, *Haematopota* and *Philipomyia* 2 and *Silvius*, *Atylotus*, *Heptatoma* with 1 species each. The most abundant species was *Tabanus bromius* accounting for 59.98%, followed by *Tabanus glaucopsis* for 12.52 %, *Tabanus maculicornis*, 6.08 %, and *Philipomyia aprica*, 4.15 %. These four species represent 82.73 % of the horsefly fauna of Gorski kotar, all the other 24 species amounting to 17.27 % (Table 2).

As compared to previously published data, seven new species of horseflies were collected in the study area (Table 1). *Chrysops viduatus* was collected in

Jasenak on 28.VI.1997 and Zelin Mrzlovodički on 14. 7. .2002., while *Hybomitra lundbecki*, *Hybomitra montana*, *Hybomitra tropica* and *Tabanus bovinus* were collected at the locality in Jasenak on 28. 6. 1997. *Tabanus exclusus* was collected at the locality Lič on 13. 7. 2002. while *Haematopota pluvialis* was collected at the following localities: Jasenak, 27. 6. 1997, 28. 6. 1997, 22.06.2000 and Lokve 27. 6. 1997. The collection includes four Mediterranean species: *Tabanus exclusus*, *Tabanus rupium*, *Tabanus spodopterus* and *Philipomyia graeca* represented by a smaller number of specimens. Most of the specimens (67.76% in total) were sampled at the following four localities: Sunger (VL 81), Jasenak (WL 00), Lokve (VL 82) and Sungerski lug (VL 81) (Table 3).

List of the ascertained species of horseflies in Gorski kotar, including localities, UTM grids, dates and numbers of collected specimens:

1. *Silvius alpinus* (Scopoli, 1763)

Sunger (VL 81) 18. 7. 1993. (1♀), Brod na Kupi (VL 83) 24. 6. 1994. (3♀), Iševnica (VL 83) 28. 6. 1996. (1♀), 16. 6. 2000. (2♀), Lič (VL 71), 13. 7. 2002. (2♀), Gerovo (VL 74), 14. 7. 2002. (1♀), Data from literature: Lokve (VL 82) –7. 1930. (1♀), Skrad (VL 93) 20.-21. 7. 1914. (1♂ 4♀), Gerovo (VL 74) 20. 7.1903. (1♀), (Moucha, 1965).

2. *Chrysops caecutiens* (L., 1758)

Brod na Kupi (VL 83), 24.06.1994 (1♀), 16.06.2000 (1♀), Lokve (VL 82), 29.06.1996 (7♀), 27.06.1997 (4♀), Matic poljana (VL 81), 21.06.2000 (1♀). Data from literature: Mrzla Vodica (VL 72), 18.08.1889 (1♀), Fužine (VL 71), 24.07.1895 (1♀), 8.08.1895 (2♀), 6.06.1897 (1♀), Skrad (VL 93), 20.07.1914 (1♀), (Moucha, 1965).

3. *Chrysops relictus* Meigen, 1820

Fužine (VL 71), 1.08.1895 (1♀), (Moucha, 1965).

4. *Chrysops viduatus* (Fabricius, 1794)

Jasenak (WL 00), 28.06.1997 (1♀), Zelin Mrzlovodički (VL 72), 14.07.2002 (2♀).

5. *Atylotus loewianus* (Villeneuve, 1920)

Sunger (VL 81), 18.07.1993 (1♀), Gerovo (VL 74), 14.07.2002 (1♀), Data from literature: Skrad (VL 93), 21.07.1914 (1♀), (Moucha, 1965).

6. *Hybomitra bimaculata* (Macquart, 1826)

Sunger (VL 81), 1.06.1994 (1♀), 27.06.1997 (1♀), Sungerski lug (VL 81), 28.06.1996 (1♀), Jasenak (WL 00) 28.06.1997 (7♀), Donji Bukovac (VL 81), 27.06.1997 (1♀), Matic poljana (VL 81), 21.06.2000 (1♀).

7. *Hybomitra distinguenda* (Verrall, 1909)

Brod na Kupi (VL 83), 24.06.1994 (1♀), 16.06.2000 (1♂), Lokve (VL 82), 29.06.1996 (4♀), Jasenak (WL 00), 28.06.1997 (2♀), Sunger (VL 81), 15.06. 2000 (1♀), 16.06.2000 (1♀), Donji Bukovac (VL 81), 28.07.1997 (1♀), Iševnica (VL 83), 16.06.2000 (1♀).

8. *Hybomitra lundbecki* Lyneborg, 1959

Jasenak (WL 00), 28.06.1997 (1♀).

9. *Hybomitra montana* (Meigen, 1820)

- Jasenak (WL 00), 28.06.1997 (1♀).
10. *Hybomitra tropica* (L., 1758)
Jasenak (WL 00), 28.06.1997 (4♀).
11. *Tabanus bovinus* L., 1758
Jasenak (WL 00), 28.06.1997 (3♀).
12. *Tabanus briani* Leclercq, 1962
Lokve (VL 82), 29.06.1996 (1♀).
13. *Tabanus bromius* (L., 1758)
Sunger (VL 81), 5.07.1987 (1♀), 31.07.1987 (3♀), 3.07.1992 (1♀), 4.07.1992 (1♀), 20.06.1993 (1♀), 27.06.1997 (2♂), 17.07.1993 (35♀), 18.07.1993 (121♀), 24.06.1994 (5♀), 26.06.1994 (1♂, 30♀), 27.06.1994 (1♀), 29.06.1996 (5♀), 24.07.1997 (2♀), 27.07.1997 (4♀), 16.06.2000 (5♀), 12.07.2002 (3♀), Risnjak (VL 53), 21.06.1993 (1♀), Brod na Kupi (VL 83), 22.06.1993 (1♀), 24.06.1994 (16♀), Čedanjanj (VL 93), 22.06.1993 (1♀), Sungerski lug (VL 81), 17.07.1993 (62♀), 28.06.1996 (31♀), Vrbovsko (WL 02), 19.07.1993 (1♀), Mrkopalj (VL 81), 28.06.1996 (2♀), Tuk Mrkopaljski (VL 81), 28.06.1996 (65♀), Lokve (VL 82), 29.06.1996 (85♀), 27.06.1997 (1♀), Jasenak (WL 00), 27.06.1997 (155♀), 28.06.1997 (17♀), 22.06.2000 (6♀), Donji Bukovac (VL 81), 27.06.1997 (6♀), 27.07.1997 (25♀), 28.07.1997 (28♀), Samarske stijene (VL 91), 28.06.1997 (2♀), Matić poljana (VL 81), 21.06.2000 (13♀), Begovo Razdolje (VL 91), 27.07.1997 (15♀), Iševnica (VL 83), 16.06.2000 (3♀), Platak (VL 63), 12.07.2002 (1♀), Omladinsko jezero (VL 71), 12.07.2002 (2♀), Lič (VL 71), 13.07.2002 (34♀), Gerovo (VL 74), 14.07.2002 (1♀), Stare laze (VL 83), 14.07.2002 (2♀). Data from literature: Gornje Jelenje (VL 62), 4.07.1957 (32♀), (Danielova, 1961), Fužine (VL 71), 21.06.1895 (1♀), 2.08.1895 (4♀), Gerovo (VL 74), 20.07.1903 (1♀), Klek (WL 11), 24.08.1902 (1♀), Skrad (VL 93), 20.07.1914 (1♀), 21.07.1914 (1♀), (Moucha, 1965).
14. *Tabanus cordiger* Meigen, 1820
Lokve (VL 82), 29.06.1996 (1♀), Donji Bukovac (VL 81), 27.06.1997 (1♀), Sunger (VL 81), 29.06.1997 (1♀), 13.07.2002 (1♀).
15. *Tabanus exclusus* Pandellé, 1883
Lič (VL 71), 13.07.2002 (3♀).
16. *Tabanus glaucopsis* Meigen, 1820
Sunger (VL 81), 21.07.1987 (1♀), 31.07.1987 (13♀), 7.08.1992 (1♀), 17.07.1993 (15♀), 18.07.1993 (5♀), 24.06.1994 (1♀), 26.06.1994 (3♀), 27.06.1994 (1♀), 27.06.1997 (2♀), 24.07.1997 (22♀), 12.07.2002 (2♀), Bjelolasica (VL 91), 21.07.1995 (2♀), Sungerski lug (VL 81), 17.07.1993 (9♀), 28.06.1996 (9♀), Tuk Mrkopaljski (VL 81), 28.06.1996 (1♀), Lokve (VL 82), 29.06.1996 (31♀), Jasenak (WL 00), 28.06.1997 (20♀), 22.06.2000 (1♀), Donji Bukovac (VL 81), 27.06.1997 (1♀), 27.07.1997 (4♀), 28.07.1997 (14♀), Matić poljana (VL 81), 21.06.2000 (4♀), Begovo Razdolje (VL 91), 27.07.1997 (7♀), Lič (VL 71), 13.07.2002 (2♀). Data from literature: Delnice (VL 82), 11.08.1897 (1♀), Fužine (VL 71), 8.08.1895 (1♀), 9.09.1897 (1♀), Gerovo (VL 74), 20.07.1903 (1♀), (Moucha, 1965).
17. *Tabanus maculicornis* Zetterstedt, 1842
Sunger (VL 81), 4.07.1992 (1♀), 17.07.1993 (1♀), 18.07.1993 (4♀), 26.06.1994 (4♀), 27.06.1997 (2♀), 24.07.1997 (3♀), Brod na Kupi (VL 83), 24.06.1994 (4♀), Sungerski lug (VL 81), 28.06.1996 (2♀), 27.06.1997 (1♀), Tuk Mrkopaljski (VL 81), 28.06.1996 (5♀), Lokve (VL 82), 29.06.1996 (3♀), Jasenak (WL 00), 28.06.1997 (34♀), Donji Bukovac (VL 81), 27.06.1997 (4♀), 27.07.1997 (1♀), Samarske stijene (VL 91), 28.06.1997 (3♀), Matić poljana (VL 81), 21.06.2000

(4♀), Iševnica (VL 83), 16.06.2000 (4♀). Data from literature: Gornje Jelenje (VL 62), 4.07.1957 (4♀), (Danielova, 1961), Skrad (VL 93), 21.07.1914 (1♀), (Moucha, 1965).

18. *Tabanus miki* Brauer in Brauer and Bergenstam, 1880

Skrad (VL 93), 20.07.1914 (1♀), (Moucha, 1965).

19. *Tabanus quatuornotatus* Meigen, 1820

Sungerski lug (VL 81), 28.06.1996 (1♀), Lokve (VL 82), 29.06.1996 (6♀), Jasenak (WL 00), 28.06.1997 (1♀), Samarske stijene (VL 91), 28.06.1997 (1♀), Matić poljana (VL 81), 21.06.2000 (1♀). Data from literature: Risnjak (VL 53), 21.06.1898 (6♀), 8.07.1962 (12♀), (Moucha, 1965).

20. *Tabanus rupium* (Brauer in Brauer and Bergenstam, 1880)

Gornje Jelenje (VL 62), 4.07.1957 (1♀), (Danielova, 1961).

21. *Tabanus spodopterus* Meigen, 1820

Sunger (VL 81), 17.07.1993 (1♀), Donji Bukovac (VL 81), 28.07.1997 (3♀). Data from literature: Skrad (VL 93), 21.07.1914 (1♀), (Moucha, 1965).

22. *Tabanus sudeticus* Zeller, 1842

Sunger (VL 81), 18.07.1993 (1♀), Lokve (VL 82), 29.06.1996 (5♀), Matić poljana (VL 81), 21.06.2000 (1♀).

23. *Tabanus tergestinus* Egger, 1859

Vrbovsko (WL 02), 19.07.1993 (1♀), 27.06.1994 (3♀), Delnice (VL 82), 20.06.1994 (1♀), Brod na Kupu (VL 83), 24.06.1994 (1♀), Sunger (VL 81), 26.06.1994 (2♀), Bjelolasica (VL 91), 21.07.1995 (2♀), Jasenak (WL 00), 28.06.1997 (17♀), 22.06.2000 (1♀). Data from literature: Gornje Jelenje (VL 62), 4.07.1957 (6♀), (Danielova, 1961).

24. *Heptatoma pellucens* (Fabricius, 1776)

Sunger (VL 81), 1.06.1994 (1♀), Lokve (VL 82), 29.06.1996 (1♀), Donji Bukovac (VL 81), 27.07.1997 (2♀), Matić poljana (VL 81), 21.06.2000 (1♀).

25. *Haematopota italica* Meigen, 1804

Lokve (VL 82), 29.06.1996 (28♀), 27.06.1997 (1♀), Jasenak (WL 00), 28.06.1997. (2♀), Sunger (VL 81), 15.06.2000 (1♀), 12.07.2002 (2♀). Data from literature: Delnice (VL 62), 10.08.1893 (1♀), 8.08.1897 (1♀), 27.08.1898 (1♀), 31.07.1902 (1♀), Klek (WL 11), 24.08.1902 (1♀), Risnjak (VL 53), 3.07.1898 (1♀), Skrad (VL 93), 20.07.1914 (1♀), (Moucha, 1965).

26. *Haematopota pluvialis* (L., 1758)

Jasenak (WL 00), 27.06.1997 (1♀), 28.06.1997 (9♀), 22.06.2000 (16♀), Lokve (VL 82), 27.06.1997 (1♀).

27. *Philipomyia aprica* (Meigen, 1820)

Gornje Jelenje (VL 62), 4.07.1992 (1♀), Sunger (VL 81), 31.07.1987 (1♀), 5.08.1992 (1♀), 17.07.1993 (8♂, 3♀), 18.07.1993 (7♀), Sungerski lug (VL 81), 17.07.1993 (8♀), Risnjak (VL 53), 19.07.1995 (1♀), Bjelolasica (VL 91), 21.07.1995 (3♀), Donji Bukovac (VL 81), 27.07.1997 (1♀), Begovo Razdolje (VL 91), 27.07.1997 (3♀), Platak (VL 63), 12.07.2002 (14♀), Lič (VL 71), 13.07.2002 (4♀), Klek (WL 11), 16.07.2002 (1♀). Data from literature: Fužine (VL 71), 8.08.1895 (1♀), Risnjak (VL 53), 30.07.1902 (1♀), (Moucha, 1965).

28. *Philipomyia graeca* (Fabricius, 1794)

Sunger (VL 81), 18.07.1993 (1♀), Lokve (VL 82), 29.06.1996 (3♀), Jasenak (WL 00), 28.06.1997 (1♀), 22.06.2000 (1♀), Matić poljana (VL 81), 21.06.2000 (1♀).

Table 1. Systematical list of the horsefly (Tabanidae) fauna of Gorski kotar, Croatia

Subfamily	Genus	Species	
Chrysopsinae	<i>Silvius</i> Meigen, 1820	<i>Silvius alpinus</i> (Scopoli, 1763)	
	<i>Chrysops</i> , Meigen, 1803	<i>Chrysops caecutiens</i> (Linnaeus, 1758)	
		<i>Chrysops relictus</i> Meigen, 1820	
		* <i>Chrysops viduatus</i> (Fabricius, 1794)	
Tabaninae	<i>Atylotus</i> Osten-Sacken, 1876	<i>Atylotus loewianus</i> (Villeneuve, 1920)	
		<i>Hybomitra</i> Enderlein, 1922	
		<i>Hybomitra bimaculata</i> (Macquart, 1826)	
		<i>Hybomitra distinguenda</i> (Verrall, 1909)	
		* <i>Hybomitra lundbecki</i> Lyneborg, 1959	
		* <i>Hybomitra montana</i> (Meigen, 1820)	
		* <i>Hybomitra tropica</i> (Linnaeus, 1758)	
	<i>Tabanus</i> Linnaeus, 1758	* <i>Tabanus bovinus</i> Linnaeus, 1758	
		<i>Tabanus briani</i> Leclercq, 1962	
		<i>Tabanus bromius</i> Linnaeus, 1758	
		<i>Tabanus cordiger</i> Meigen, 1820	
		* <i>Tabanus exclusus</i> Pandellé, 1883	
		<i>Tabanus glaucopis</i> Meigen, 1820	
<i>Tabanus maculicornis</i> Zetterstedt, 1842			
<i>Tabanus miki</i> Brauer in Brauer and			
		<i>Tabanus quatuornotatus</i> Meigen, 1820	
		<i>Tabanus rupium</i> (Brauer in Brauer and	
Bergensam, 1880			
Bergensam, 1880)		<i>Tabanus spodopterus</i> Meigen, 1820	
		<i>Tabanus sudeticus</i> Zeller, 1842	
		<i>Tabanus tergestinus</i> Egger, 1859	
	<i>Heptatoma</i> Meigen, 1803	<i>Heptatoma pellucens</i> (Fabricius, 1776)	
	<i>Haematopota</i> Meigen, 1803	<i>Haematopota italica</i> Meigen, 1804	
		* <i>Haematopota phuvialis</i> (Linnaeus, 1758)	
	<i>Philipomyia</i> Oslufjev, 1964	<i>Philipomyia aprica</i> (Meigen, 1820)	
		<i>Philipomyia graeca</i> (Fabricius, 1794)	
	Σ 2	8	28

Legend: * new species for the researched area.

Table 2. Quantitative distribution of the horsefly (Tabanidae) fauna
 of Gorski kotar

Species	Specimens	%
1. <i>Tabanus bromius</i>	838	59.98
<i>Tabanus glaucopis</i>	175	12.52
<i>Tabanus maculicornis</i>	85	6.08
<i>Philipomyia aprica</i>	58	4.15
<i>Haematopota italica</i>	41	2.93
<i>Tabanus tergestinus</i>	34	2.43
<i>Tabanus quatuornotatus</i>	28	2.00
<i>Haematopota pluvialis</i>	27	1.93
<i>Chrysops caecutiens</i>	20	1.43
<i>Silvius alpinus</i>	17	1.21
<i>Hybomitra bimaculata</i>	12	0.85
<i>Hybomitra distinguenda</i>	12	0.85
<i>Tabanus sudeticus</i>	7	0.50
<i>Philipomyia graeca</i>	7	0.50
<i>Tabanus spodopterus</i>	5	0.35
<i>Heptatoma pellucens</i>	5	0.35
<i>Hybomitra tropica</i>	4	0.28
<i>Tabanus cordiger</i>	4	0.28
<i>Chrysops viduatus</i>	3	0.21
<i>Atylotus loewianus</i>	3	0.21
<i>Tabanus bovinus</i>	3	0.21
<i>Tabanus exclusus</i>	3	0.21
<i>Chrysops relictus</i>	1	0.07
<i>Hybomitra lundbecki</i>	1	0.07
<i>Hybomitra montana</i>	1	0.07
<i>Tabanus briani</i>	1	0.07
<i>Tabanus miki</i>	1	0.07
<i>Tabanus rupium</i>	1	0.07
Σ 28	1397	100

Table 3. Abundance of horseflies per locality

Localities	UTM grids	Specimens	%
Sunger	VL 81	339	24.26
Jasenak	WL 00	301	21.54
Lokve	VL 82	183	13.09
Sungerski lug	VL 81	124	8.87
Donji Bukovac	VL 81	92	6.58
Tuk Mrkopaljski	VL 81	71	5.08
Lič	VL 71	45	3.22
Gornje Jelenje	VL 62	44	3.14
Brod na Kupi	VL 83	29	2.07
Matić poljana	VL 81	27	1.93
Begovo Razdolje	VL 81	25	1.78
Risnjak	VL 53	22	1.57
Platak	VL 63	15	1.07
Fužine	VL 71	13	0.93
Skrad	VL 93	13	0.93
Iševnica	VL 83	11	0.78
Bjelolasica	VL 91	7	0.50
Samarske stijene	VL 91	6	0.42
Gerovo	VL 74	6	0.42
Delnice	VL 82	6	0.42
Vrbovsko	WL 02	5	0.35
Klek	WL 11	3	0.21
Mrkopalj	VL 81	2	0.14
Omladinsko jezero	VL 71	2	0.14
Stare laze	VL 83	2	0.14
Zelin Mrzlovodički	VL 72	2	0.14
Čedanj	VL 93	1	0.07
Mrzla Vodica	VL 72	1	0.07
Σ 28	14	1397	100

Table 4. Comparison of capture methods per species. Horses = collected by sweep-net on animals; Car = collected by hand in the car

Species	Horses	Car
<i>Silvius alpinus</i>	-	+
<i>Chrysops caecutiens</i>	+	-
<i>Chrysops viduatus</i> *	+	-
<i>Atylotus loewianus</i>	-	+
<i>Hybomitra bimaculata</i>	+	+
<i>Hybomitra distinguenda</i>	+	+
<i>Hybomitra lundbecki</i> *	+	-
<i>Hybomitra montana</i> *	+	-
<i>Hybomitra tropica</i> *	+	-
<i>Tabanus bovinus</i> *	+	-
<i>Tabanus briani</i>	+	-
<i>Tabanus bromius</i>	+	+
<i>Tabanus cordiger</i>	+	+
<i>Tabanus exclusus</i> *	-	+
<i>Tabanus glaucopis</i>	+	+
<i>Tabanus maculicornis</i>	+	+
<i>Tabanus quatuornotatus</i>	+	+
<i>Tabanus spodopterus</i>	+	+
<i>Tabanus sudeticus</i>	+	+
<i>Tabanus tergestinus</i>	+	+
<i>Heptatoma pellucens</i>	+	-
<i>Haematopota italica</i>	+	+
<i>Haematopota pluvialis</i> *	+	+
<i>Philipomyia aprica</i>	+	+
<i>Philipomyia graeca</i>	+	-
Σ	22	16

Legend: * new species in the fauna of Gorski Kotar.

Discussion

Prior to this study, the horsefly fauna of the Gorski kotar region was relatively unknown. Previous studies revealed the presence of the following 14 species: *Silvius alpinus*, *Chrysops caecutiens*, *Chrysops relictus*, *Atylotus loewianus*, *Tabanus bromius*, *Tabanus glaucopis*, *Tabanus maculicornis*, *Tabanus miki*, *Tabanus quatuornotatus*, *Tabanus rupium*, *Tabanus spodopterus*, *Tabanus tergestinus*, *Haematopota italica*, *Philipomyia aprica* (Danielova, 1961; Moucha, 1965). Thanks to entomological research carried out during 1992-1996, the number of horsefly species recorded in Gorski kotar increased considerably, to 21 species (Krčmar & Mikuska, 1998). During the 1996 - 1998 and 2000 - 2002 study period, seven new species were recorded in the Gorski kotar region, increasing the total number of recorded species to 28. During the research, the species *Hybomitra tropica* and *Heptatoma pellucens* were ascertained. These two species were only recently recorded in Croatia (Majer, 1985). The species *Tabanus bromius*, *Tabanus glaucopis* and *Tabanus maculicornis* are the most abundant species in the studied area, since they were recorded at most localities. These three are the most frequent species of the family Tabanidae, widespread throughout Europe (Chvála et al. 1972). Samplings of the species *Hybomitra montana* at the locality Jasenak (WL 00) represent the second finding for Croatia. This species was previously mentioned in the literature, without the number of collected specimens or the date, and allegedly collected in the town of Rijeka (Brauer, 1880; Surcouf, 1924). Thus, our record makes the first properly documented finding of *Hybomitra montana* in Croatia.

Most of the established species (21) belong to the Boreal – Eurasian type of fauna according to Olsufjev (1977). Additionally, four Mediterranean and three South European species were determined. The majority of collected specimens are females that were in most cases collected while taking a blood meal from horses. The number of specimens collected at individual localities depends on the presence of domestic animals (horses). This explains the great difference in the number of collected specimens and species of horseflies in comparison to other localities where domestic animals are not present (Table 3, 4). The 28 determined species of horseflies indicate the necessity to continue with faunistic research, because this is certainly not the final number of species of horseflies in Gorski kotar.

Conclusion

A sample of 1397 horsefly specimens (Tabanidae) was collected in Gorski kotar. The 28 species were determined in the sample, classified into following genera: *Silvius*, *Chrysops*, *Atylotus*, *Hybomitra*, *Tabanus*, *Heptatoma*, *Haematopota* and *Philipomyia*. The collected sample contained seven species new for the study area: *Chrysops viduatus*, *Hybomitra lundbecki*, *Hybomitra montana*, *Hybomitra tropica*, *Tabanus bovinus*, *Tabanus exclusus* and *Haematopota pluvialis*. The most abundant species of horseflies are *Tabanus bromius* at 59.98 %, followed by *Tabanus glaucopsis* at 12.52 %, *Tabanus maculicornis* at 6.08 % and *Philipomyia aprica* at 4.15 %. These four species represent 82.73 % of the horsefly fauna in Gorski kotar, whereas all the other 24 species amount to 17.27 %. The determined species were collected at 28 localities covering 14 fields on the UTM grid of Croatia. Moreover, the determined species make up 36.36 % of the horsefly fauna of Croatia.

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