

Fauna of Horseflies (Diptera, Tabanidae) of the South of the Middle Russian Forest-Steppe and Adjoining Steppe Territories

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Abstract—The available data on horseflies of the south of the Middle Russian forest-steppe and adjoining steppe territories within Belgorod and Voronezh provinces of Russia and Kharkov Province of Ukraine are summarized, analyzed, and clarified. Altogether, 46 species and 1 subspecies of horseflies are recorded in the region, of which 15 species are restricted to the forest-steppe zone, 10 species, to the steppe zone, and 22 species are widespread or extend into the adjoining zones where they find suitable conditions. The horsefly faunal complexes in the three provinces have the same landscape-zonal structure. The forest and forest-steppe species form the greatest fraction comprising more than 60% of the total species number. The taiga-forest species have similar shares in Voronezh and Kharkov provinces: 16% in each, while in Belgorod Province such species comprise only 6%. The steppe and semi-desert species comprise 25% and 19% in Belgorod and Voronezh provinces, respectively; the fraction of steppe species in Kharkov Province is only 12%.

Keywords: fauna, horseflies, Tabanidae, distribution, landscape associations, Kharkov Province, Belgorod Province, Voronezh Province, Middle Russian forest-steppe

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Horseflies are of great medical and veterinary significance (Tarasov, 1996). Therefore, special research of this dipteran family has been carried out for over a century and still has not lost its urgency. Some papers and monographs have been published on horseflies of the northern and central regions of European Russia, but data for the south of European Russia and adjoining territories are scarce and restricted to Voronezh, Belgorod, and Kharkov provinces, while Kursk, Sumy, and Lugansk provinces remain unexplored in this respect.

This paper is focused on summarizing, analysis, and clarifying the available data on the horseflies of the south of the Middle Russian forest-steppe and the adjoining steppe territories.

CHARACTERISTIC OF THE REGION

The south of the Middle Russian forest-steppe and the adjoining steppe territories are located in the central and southern parts of the Russian Plain, namely on the

south slopes of the Central Russian Upland and in the northwestern part of the Kalach Upland. Administratively, this territory corresponds to Kharkov Province of Ukraine and Belgorod and Voronezh provinces of Russia. The forest-steppe zone occupies the western, central, and northern parts of each of these provinces, whereas their southern and eastern parts belong to the steppe zone. The regional terrain is characterized by prevalence of slopes due to a dense network of river valleys, gullies, and ravines.

The rivers are of the lowland type. The largest of them are the Severskiy Donets, Oskol, Tikhaya Sosna, Udy, Veliky Burluk, Don, Bityug, and Khoper. Lakes are relatively scanty and not large; they are mainly derived from river meanders and located in bottomlands. The largest lakes occur in the valleys of the Severskiy Donets, Oskol, Mzha, Udy, Don, and Khoper. In many places, such as the river valleys, gullies, and kettles in flat divides, groundwater comes to the surface swamping the territory and forming lowland, transitional, and

pit bogs. Besides natural water bodies there are numerous artificial ponds and reservoirs.

The biotopes suitable for development of horsefly larvae in the study territory are rivers with low swamped banks, lowland, transitional, and pit bogs, various small water bodies, such as ponds, pits, and ditches overgrown with higher aquatic vegetation, and also humid forb meadows.

Adult horseflies can inhabit various open biotopes: shores of water bodies, bottomland, steppified, and calciphytic meadows, steppe areas, and also swamps, edges of oak, deciduous, and mixed forests, and dry pine forests (Bevz et al., 1965; Milkov, 1987; Gilborg, 1999; Avramenko et al., 2007).

MATERIALS AND METHODS

This paper is based on my own collections and also the available published and unpublished data. Names of species are given according to the Fauna Europaea database (<https://fauna-eu.org/>). The biotopic preferences and the range types of horseflies are described taking account of the data provided by Boshko (1973), Olsufjev (1977), Skufjin (1975, 1998), and the Fauna Europaea database. Distribution over landscape zones is described based on the latest publications (Chirov and Peterson, 2000; Pestov, 2005; Smirnov et al., 2006; Abarykova, 2007; Smirnova and Belova, 2007; Atiagulova, 2008; Isimbekov and Madieva, 2008; Isimbekov and Nurlina, 2008; Peterson and Chirov, 2008; Petrov et al., 2008; Bogdanov and Zaulitskaya, 2010; Egorov, 2010; Pestov and Panyukova, 2010; Zaulitskaya, 2010; Agapitova and Balakhonova, 2011; Egorov et al., 2011; Pavlova et al., 2012; Fedorov, 2012; Dementiev, 2014; Rassolova, 2014; Agasoi, 2015; Cherednichenko and Vasilevich, 2015; Gladun and Sysoev, 2015; Ostrovsky, 2015; Budaeva and Ruchin, 2016; *Gosudarstvennyi kadastr...*, 2016). The presence, landscape preferences, and biotopic associations of horseflies in Kharkov Province are given according to Prudkina and Pavlov (2001); in Belgorod Province, according to my own, partly published data (Prisniy, 2016) and the unpublished data of A.E. Silina; in Voronezh Province, according to Skufjin (1975, 1979, 1998), Vislevskaya and Budaeva (2015), Panteleeva (2005), Boshko (1973) and Olsufjev (1977). The larvae are characterized according to the data of Violovich (1968), Skufjin (1968, 1998), Olsufjev (1977), Bykova (1985), and Andreeva (1990).

RESULTS

Altogether, 46 species and 1 subspecies of horseflies belonging to 8 genera of 3 subfamilies have been recorded in the region; 15 species are restricted to the forest-steppe zone, 10 species, to the steppe one, and 22 species are either widely distributed or extend into adjoining zones where they find suitable conditions for development and adult life. All the species revealed in the region or recorded in the literature are classified into faunistic complexes and groups, with changes and supplements according to Skufjin (1998) (Table 1).

DISCUSSION

The horsefly faunas of Voronezh, Belgorod, and Kharkov provinces (VP, BP, and KhP, respectively) had practically equal levels of pairwise similarity: Sørensen's species similarity index was 0.69 for VP and BP, 0.68 for BP and KhP, and 0.67 for VP and KhP. Faunistic similarity was largely determined by the forest and forest-steppe species; therefore, if the purely steppe and semi-desert species were excluded from comparison and only the species complexes occurring in the south of the Middle Russian forest-steppe were analyzed, the Sørensen's index values would be even higher: 0.88 for VP and BP, 0.80 for VP and KhP, and 0.81 for BP and KhP. Thus, the horsefly complexes of the three provinces were quite similar within the forest-steppe zone. The species diversity in the region decreased from east to west; this may be related both to the general level of knowledge of different territories and to the diversity of biotopic conditions.

The only taiga species *Hybomitra nigricornis* (Zetterstedt, 1842) was recorded only in Voronezh Province, apparently at the southern boundary of its distribution. Among the five widespread polyzonal taiga-forest species, *H. lurida* (Fallen, 1817), *H. lundbecki* Lyneborg, 1959, and *H. montana montana* (Meigen, 1820) occurred in Kharkov and Voronezh provinces, the first two species being restricted to the forest-steppe zone, and the third partly extending into the steppe zone along river valleys. *Hybomitra bimaculata* (Macquart, 1826), distributed both in the forest and the steppe zones, was recorded in all the three provinces, while *H. nitidifrons confiformis* Chvala et Moucha, 1971 was found in Belgorod and Voronezh provinces. The last two species seem to be less strictly associated with the biotopic conditions of pine forests, which are practically absent in

Table 1. Faunistic complexes of Tabanidae in the south of Middle Russian forest-steppe and adjoining steppe territories

Species	Range type ¹	LZC ²	Presence ³			ZC ⁴	BC ⁵	Larvae ⁶
			KhP	BP	VP			
I. Taiga-forest and taiga complex								
Taiga species								
<i>*Hybomitra nigricornis</i> (Zetterstedt, 1842)	EA	T			+	EZ	PFor	HH
Taiga-forest species								
<i>Hybomitra montana montana</i> (Meigen, 1820)	P	TF	+		+	PZ	PFor	HH
<i>*Hybomitra lurida</i> (Fallen, 1817)	H	TF	+		+	PZ	PFor	HH
<i>*Hybomitra lundbecki</i> Lyneborg, 1959	E-WS	TF	+		+	PZ	PFor	HH
<i>Hybomitra bimaculata</i> (Macquart, 1826)	P	TF	+	+	+	PZ	For	HH
<i>*Hybomitra nitidifrons confiformis</i> Chvala et Moucha, 1971	H	TF		+	+	PZ	For	HH
II. Euro-Siberian forest and forest-steppe complex								
Forest species								
<i>*Heptatoma pellucens pellucens</i> (Fabricius, 1776)	E-WS	F			+	EZ	For	H
<i>Haematopota crassicornis</i> Wahlberg, 1848	E-WS	FS	?		+	EZ	For	HH
<i>*Haematopota italica</i> Meigen, 1804	E	F	+			EZ	For	–
<i>*Chrysops divaricatus</i> Loew, 1858	E-S	F			+	PZ	PFor	H
<i>*Tabanus maculicornis</i> Zetterstedt, 1842	E-WS	F		+	+	PZ	For	HH
<i>*Atylotus fulvus fulvus</i> (Meigen, 1804)	E-S	F	+	+	+	PZ	For	HH
<i>Chrysops caecutiens caecutiens</i> (L., 1758)	E-S	F	+	+	+	PZ	For	H
<i>Hybomitra distinguenda distinguenda</i> (Verrall, 1909)	E-S, C	F		+	+	PZ	For	HH
<i>Haematopota pluvialis pluvialis</i> (L., 1758)	E-S	F	+	+	+	PZ	For	E
<i>Tabanus miki miki</i> Brauer, 1880	E-S, C	F	+	+	+	PZ	For	HH
<i>Tabanus bovinus</i> L., 1758	E-S, C	F	+	+	+	PZ	For	E
<i>Chrysops viduatus</i> (Fabricius, 1794)	E-WS	F	+	+	+	PZ	For	H
<i>Tabanus sudeticus sudeticus</i> Zeller, 1842	E	F	+	+	+	PZ	For	E
<i>*Tabanus glaucopsis</i> Meigen, 1820	E-S, C	F		+	+	PZ	For	E
Forest-steppe species								
<i>*Chrysops parallelogrammus</i> Zeller, 1842	WE	FS			+	Z	Mead-For	–
<i>*Chrysops concavus</i> Loew, 1858	EE-WS	FS			+	Z	Mead-For	–
<i>Chrysops relictus</i> Meigen, 1820	E-S	FS	+	+	+	PZ	Mead-For	H
<i>Chrysops rufipes</i> Meigen, 1820	E-S	FS	+	+	+	PZ	Mead	H
<i>Hybomitra ciureai</i> (Seguy, 1937)	E-S	FS	+	+	+	PZ	Mead-For	HH
<i>Hybomitra muehlfeldi</i> (Brauer, 1880)	E-S, C	FS		+	+	PZ	Mead-For	HH
<i>Tabanus autumnalis autumnalis</i> L., 1761	E-WS	FS	+	+	+	PZ	Mead-For	E
<i>Haematopota subcylindrica</i> Pandelle, 1883	E-WS	FS	+	+	+	PZ	Mead-For	E
<i>Atylotus rusticus</i> (L., 1761)	E-WS	FS	+	+	+	PZ	Mead	HH
<i>Tabanus bromius bromius</i> L., 1758	E-WS, C	FS	+	+	+	PZ	Mead-For	E
III. South European–Siberian complex								
Forest-steppe species								
<i>*Chrysops flavipes flavipes</i> Meigen, 1804	SE	FS	+	+	+	Z	Step	H

Table 1. (Contd.)

Species	Range type ¹	LZC ²	Presence ³			ZC ⁴	BC ⁵	Larvae ⁶
			KhP	BP	VP			
Steppe species								
** <i>Haematopota pallidula</i> (Krober, 1922)	E-K	S	+		+	Z	Step	E
** <i>Haematopota pallens</i> Loew, 1871	SE-CA, C	S		+	+	PZ	Step	HH
** <i>Haematopota turkestanica</i> (Krober, 1922)	SE-CA	S			+	PZ	Step	E
IV. Mediterranean faunistic complex								
Forest and mountain-forest species								
* <i>Silvius alpinus</i> (Scopoli, 1763)	SE, C	F			+	PZ	For	E
<i>Tabanus unifasciatus</i> Loew, 1858	SE, C	F		+		EZ	Mt-For	HH
** <i>Tabanus tergestinus</i> Egger, 1859	SE, C	F			+	EZ	Mt-For	E
Steppe and semi-desert species								
<i>Atylotus latistriatus</i> Brauer, 1880	SE	S		+		EZ	WStep	E
** <i>Chrysops caecutiens ludens</i> Loew, 1858	SE, C	S			+	EZ	SStep	H
* <i>Pangonius pyritosus</i> Loew, 1859	SE	S	+	+		EZ	WStep	E
<i>Hybomitra expollicata expollicata</i> (Pandelle, 1883)	SE-CA	S, SD		+	+	PZ	Step	HH
** <i>Atylotus quadrifarius</i> (Loew, 1874)	SE-CA	S, SD			+	EZ	SStep	H
** <i>Hybomitra acuminata</i> (Loew, 1858)	SE-MA	S, D		+	+	EZ	SStep	H
Riparian species								
<i>Chrysops italicus</i> Meigen, 1804	SE	R	+	+		IPZ	Mead	HH
** <i>Hybomitra ukrainica</i> (Olsufjev, 1952)	SE	S	+	+		EZ	WStep	H
** <i>Atylotus flavoguttatus</i> (Szilady, 1915)	SE	S, D		+		EZ	SStep	H
** <i>Hybomitra peculiaris</i> (Szilady, 1914)	SE-CA	S, D		+		EZ	SStep	H
Total number of species			24 (25)	32	38			

¹ Range type: H, Holarctic; P, Palearctic; EA, Eurasian; E, European; WE, West European; SE, South European; E-S, Euro-Siberian; E-WS, European–West Siberian; EE-WS, East European–West Siberian; C, Caucasian; E-K, European–Kazakhstanian; SE-CA, South European–Central Asian. ² LZC (landscape-zonal characteristic): T, taiga; TF, taiga-forest; F, forest; FS, forest-steppe; S, steppe; SD, semi-desert; D, desert; R, riparian. ³ Presence in the region: KhP, Kharkov Province; BP, Belgorod Province; VP, Voronezh Province. ⁴ ZC (zonal characteristic): EZ, extrazonal; Z, zonal; PZ, polyzonal; IPZ, intrapolyzonal. ⁵ BC (biotopic characteristic): PFor, pine forest; For, forest; Mead-For, meadow-forest; Mead, meadow; Step, steppe; WStep, west steppe; SStep, south steppe; Mt-For, mountain-forest. ⁶ Larvae: E, edaphobiont; HH, hemihydrobiont; H, hydrobionts. * species restricted to the forest-steppe zone in the study region; ** species restricted to the steppe zone; ? mentioned by Olsufjev (1977).

Belgorod Province but are present in the east of the forest-steppe zone in Kharkov Province; at the same time, forest conditions are imitated by numerous forest stands and bogs in the northern and central parts of Voronezh Province, within the forest-steppe part of the Don River valley. The above assumption is also supported by the fact that *Chrysops divaricatus* Loew, 1858, preferring pine forests, was recorded only in Voronezh Province. This species occurred there at the southern boundary of its distribution, similar to *Tabanus maculicornis* Zetter-

stedt, 1842 that was recorded in Voronezh and Belgorod provinces.

Among the forest species, *Heptatoma pellucens pellucens* (Fabricius, 1776) and *Haematopota crassicornis* (Wahlberg, 1848), which were earlier found in Voronezh Province, have not been recently recorded. The latter species was earlier also recorded for Kharkov Province but has not been revealed there of late. These two species were recorded outside the main part of their range;

since they are associated with bogs and river bottomlands, their disappearance from the study territories may be related to general warming and changes in the hydrological regime.

The forest species *Haematopota italica* (Meigen, 1804) is absent in Belgorod and Voronezh provinces but it was recorded in Kharkov Province. This species seems to be spreading eastwards since its distribution boundary earlier ran northwest of the studied provinces. At the same time, the general situation with *H. italica* seems to be the same as with the preceding two species.

Such forest species and subspecies as *Chrysops caecutiens caecutiens* (L., 1758), *C. viduatus* (Fabricius, 1794), *Tabanus miki miki* (Brauer, 1880), *T. sudeticus sudeticus* Zeller, 1842, *T. bovinus* L., 1758, *Haematopota pluvialis pluvialis* (L., 1758), and *Hybomitra distinguenda distinguenda* (Verrall, 1909) have been recorded in the forest-steppe zone of all the three provinces (except the latter species) and also extend to the south, into the steppe zone. Unlike them, the forest species *Atylotus fulvus fulvus* (Meigen, 1804) was also recorded in all the three provinces but, similar to *Tabanus glaucopis* Meigen, 1820, it was restricted to the forest-steppe zone.

Hybomitra distinguenda was not recorded in Kharkov Province since its range boundary passes somewhat north of this territory. Yet, this species may still be present there since it was recorded in the immediate vicinity of the Russian-Ukrainian border. The more widespread *T. glaucopis* was recorded in Belgorod and Voronezh provinces; however, similar to *H. distinguenda*, the study region lies at the boundary of its range and, correspondingly, the species is absent in Kharkov Province.

Of the forest-steppe species, *Chrysops parallelogrammus* Zeller, 1842 was recorded only in Belgorod Province, at the eastern boundary of its range, but the allopatric species *C. concavus* Loew, 1858 was recorded in Voronezh Province. *Chrysops flavipes flavipes* Meigen, 1804 was recorded in all the three provinces, but everywhere it was restricted to the forest zone which is its northern distribution boundary. The remaining forest-steppe species and subspecies, namely *C. relictus* Meigen, 1820, *C. rufipes* Meigen, 1820, *Hybomitra ciureai* (Seguy, 1937), *H. muehlfeldi* (Brauer, 1880), *Tabanus autumnalis autumnalis* L., 1761, *T. bromius bromius* L., 1758, *Haematopota subcylindrica* Pandelle, 1883, and

Atylotus rusticus (L., 1761), extend into the steppe zone everywhere. At the same time, *H. muehlfeldi* was not found in Kharkov Province, possibly due to insufficient knowledge of its southern and southeastern territories.

Of the mountain-forest species, *Tabanus unifasciatus* Loew, 1858 was recorded in Belgorod Province, and *Silvius alpinus* (Scopoli, 1763) and *T. tergestinus* Egger, 1859, in Voronezh Province. The first species was earlier known from Zakarpattia and Donetsk provinces of Ukraine, and now it may be also present in the territories adjoining Belgorod Province. The two other species were once found in Voronezh Province more than half a century ago, and their modern presence there requires confirmation. *Haematopota pallens* Loew, 1871, *H. pallidula* (Krober, 1922), and *H. turkestanica* (Krober, 1922), recorded in Voronezh Province, were restricted to the steppe zone; *H. pallens* was also found in Belgorod Province, and *H. pallidula*, in Kharkov Province.

Of the steppe species, *Atylotus latistriatus* Brauer, 1880, *Pangonius pyritosus* Loew, 1859, and *Hybomitra expollicata expollicata* (Pandelle, 1883) extend into the forest-steppe zone. All the three species were recorded in Belgorod Province; *P. pyritosus* was earlier also recorded in Kharkov Province, and *H. expollicata*, in Voronezh Province. *Atylotus quadrifarius* (Loew, 1874), *Chrysops caecutiens ludens* Loew, 1858, and *Hybomitra acuminata* (Loew, 1858), recorded in Voronezh Province (the latter also in Belgorod Province), occurred only in the steppe zone.

Chrysops italicus Meigen, 1804 and *Hybomitra ukrainica* (Olsufjev, 1952), the riparian species spreading along river bottomlands, were recorded in Kharkov and Belgorod provinces. *Hybomitra peculiaris* (Szilady, 1914) and *Atylotus flavoguttatus* (Szilady, 1915), found in Belgorod Province, may penetrate into the southern forest-steppe in a similar manner.

The distribution of taxa by their landscape-zonal associations was as follows. The forest and forest-steppe species formed the greatest fraction: over 60% in each province. The shares of taiga-forest species were similar in Voronezh and Kharkov provinces: 16% in each, whereas in Belgorod Province these species comprised only 6%. The steppe and semi-desert species comprised 25% in Belgorod Province and 19% in Voronezh Province, while in Kharkov Province the steppe species comprised only 12%.

Practically all the species included in the taiga + taiga-forest and Euro-Siberian forest + forest-steppe complexes (except *Hybomitra nigricornis*, *H. crassicornis*, *H. italica*, and *Heptatoma pellucens* which are extrazonal for the study region) are polyzonal and occur in the region within their normal ranges. By contrast, species of the South European–Siberian and Mediterranean faunistic complexes (with the exception of three polyzonal species: *S. alpinus*, *Hybomitra expollicata*, and *C. italicus*) are extrazonal for the study region and occur there either at the northern boundaries of their main ranges or outside them, in areas with suitable conditions for development.

In view of the above, it may be concluded that the south of the Middle Russian forest-steppe and the adjoining steppe localities are now sufficiently studied as concerns the fauna and distribution of horseflies, and new species records are unlikely to appear in the near future. At the same time, further research may clarify the relative abundance of some groups; besides, some extrazonal species may disappear from the study territory.

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COMPLIANCE WITH ETHICAL STANDARDS

All applicable international, national, and institutional guidelines for the care and use of animals were followed. All procedures performed in studies involving animals were in accordance with the ethical standards of the institution or practice at which the studies were conducted.

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