Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2019, 9(2), 57-67

ORIGINAL ARTICLE *UDC 576.895.771*

Faunal overview of horseflies (Diptera, Tabanidae) of Tyumen region

R.P. Pavlova, E.I. Sivkova

All-Russian Scientific Research Institute of Veterinary Entomology and Arachnology, Branch of Federal State Instution, Federal Research Centre, Tyumen Scientific Centre of Siberian Branch of the Russian Academy of Sciences, Tyumen, Russia.

E-mail: sivkovaei@mail.ru

Received: 20.03.2019. Accepted: 25.04.2019

The interest in studying the fauna of horseflies in the Tyumen region is based on a pronounced zonal distribution covering almost all areas (except the steppe) of Russia, and geography: to the east of the Ural Mountains separating two continents, and is associated with intensive development of this territory having the richest deposits of oil and gas. This article systematizes and summarizes the available literature data and materials of own researches. Intensive study of the species composition of horseflies of the Tyumen region was carried out in the period from the 60s to the 80s of the last century. Currently, it is a topic of interest of just some individual researchers. Data are available on the ecological-faunal survey of horseflies (Diptera, Tabanidae) of the middle taiga of Western Siberia (Dukhin, 2009), on the fauna of Tobolsk and Tobolsk District (Maslovskaya, 2016), Kurgan Region (Agapitova & Balakhonova, 2011). The faunal list of horseflies of the Tyumen region includes 42 species and one subspecies of six genera, including Chrysops-6, Tabanus-6, Atylotus 4, Hybomitra -20 species and one subspecies, Heptatoma-1 and Yaematopota-5 species. Dominant and subdominant, causing the most inconvenience to the animals on pastures, within one season are 6-7 species, which together account for more than 90% of the attacking horseflies, and according to long-term data, their number reaches 13-14. Horseflies are distributed unevenly on the territory of the region, due to natural and climatic factors. Horseflies can not be found in the typical tundra. Moving to the south of the region, the number of their species increases from 6 in the area of shrub tundra to 35 in the south of the forest area. The fauna is growing both due to the appearance of species characteristic for the given area and due to their penetration from neighboring zones and subzones. Of the 43 species and subspecies of horseflies, 24 are potential vectors of agents of various human and animal diseases. On pastures, where there is the highest concentration of parasitizing horseflies, their vector role becomes especially dangerous if there are sick animals in the herd.

Keywords: Horseflies; Tyumen region; fauna; index of dominance

Introduction

The Tyumen Region occupies the largest part of the West Siberian Plain and extends from the Kara Sea in the North to steppes of Kazakhstan in the South, and from the Ural Mountains in the West to the Tazo-Yenisei watershed in the East. The distance between the extreme points from North to South is 2,100 km and from west to east is 1,400 km. The Tyumen region occupies the area of 1,435.2 thousand km². Administratively, the region has two autonomous districts: Yamalo-Nenets and Khanty-Mansiysk, as well as the Tyumen region itself, which occupies the southern part of the territory. In terms of landscape-climatic characteristics, the Tyumen region has the following natural areas: tundra, forest tundra, forest zone, and forest-steppe. The forest zone is divided into the subzones: the northern, middle and southern taiga and deciduous aspen-birch forests. The territory of the Tyumen region is distinguished by poorly broken ground, insufficient drainage, widespread permafrost in the North (including the northern taiga), the presence of endless swamps, many lakes and full-flowing rivers. The climate is moderately continental, but much more continental than to the West of the Ural Mountains, and is characterized by short summers, harsh winters with strong winds, returns of cold in spring, late spring and early autumn frosts (Richter, 1963).

Materials and methods

Field works were conducted on cattle pastures. Traps for collection of horseflies: Skufyin manikin-type trap and spherical type and "teddy-go-round"-type traps of own development (Pavlov et al., 1969, 1988). The surveys were carried out mainly during the day-twice a decade. In addition, to identify the species types, insects were collected directly from animals, larvae and pupae were collected as well. The identification of species was carried out according to the identifying tables given in the

monographs of N. G. Olsufyev and N. A. Violovich. (Olsufiev, 1935, 1936, 1937, 1962, 1972, 1977, 1985; Violovich, 1966, 1967, 1968). The correctness of the identification was confirmed by prof. N.G. Olsufiev. The index of dominance (ID) was determined by the percentage of individuals of species in relation to the total abundance of all the compared individuals. According to the degree of abundance, 4 groups of species were distinguished: dominant or mass (ID above 8%), subdominant or numerous (ID from 2 to 8%), numerically insignificant (ID from 0.5 to 2%) and rare (ID less than 0.5%).

Stationary collections were carried out near the following locations: in the middle taiga subzone-5 villages of the Khanty-Mansiysk Autonomous Okrug; in the southern taiga subzone-18 villages of Nizhnetavdinsky and Yarkovsky districts; in the subzone of deciduous aspen-birch forests-13 villages of the Tyumen region Besides, we have verified the correctness of the definition of horseflies in the collections performed by VNIIVEA employees: V.A. Shchepetkin-tundra (the river Longotygan, the village Syadayharvut) and the forest-tundra (the village Nyda), S.N. Gagarin-the forest-tundra (the village Labytnangi, Muzhy), G.K. .Krasnoel'kup, Tolka), E.G. Zavyalova and I.N. Ishmuratov-the middle taiga (Surgut and Berezovsky districts).

Results and discussion

The first information on horseflies in the Tyumen region is given in the work of K.P. Samko, who found 16 species in the area of the city of Tobolsk: *Chrysops caecutiens* L., *Ch. Relictus* Mg., *Tabanus mabanus maculicornis* Ztt., *T. Bromius* L., *T/ bovinus* L. (=*T. Bovinus* Lw.), *T. Austumnalis* L., *Atylotus fulvus* Mg., *A. Rusticus* L., *Hybomitra kaurii* Chv.et Lyn. (=*H. borealis* Mg., =*H. borealis* Lw.), *H. tarandina* L„ *H. lurida* Flln., *H. nitidifrons* Szil. (=*Tabanus Confinis* Ztt., =*H. conformis* Frey.), *H. bimaculata* Macq. (~*Tabanus tropicus* Panz.), .*H. lundbecki* Lyn. (=*Tabanus fulvicornis* Mg.), *Haematopota pluvialis* L., Hm. Crassicornis Wahlbg/ (Samko, 1929). The works of H.G.Olsufyev additionally determined the following species: *Chrysops nigripes* Ztt., *Atylotus sublunaticomis* Ztt., *Hybomitra sexfasciata* Hine, *H. lappononica* Wahlbg., *H. astuta* O.S. (=*Tabanus polaris* Frey), *H. arpadi* Szil., *H. aequetincta* Beck. (=*Tabanus flaviped.*), *H. montana montana* Mg (Olsufyev, 1937).

O. Sazonova, who conducted research in the lower reaches of the Ob and Irtysh rivers, supplemented the list with the following species: *Chrysups divaricatus* Lw., *Haematopota subcylindrica* Pand. She also determined *Tabanus muehlfeldi* Br., identified in accordance with I.G.Olsufyev table (Sazonova, 1949). However, as was later established, this species name was given erroneously and it was renamed as Tabanus staegeri Lyn.. According to the modern classification, this species is defined as *Hybomitra montana morgani* Surc., belonging to the southern steppe species, and therefore the finding of this species in the lower reaches of Irtysh needs to be confirmed. In addition, she identified *Tabanus solstitialis* Schin., also identified by the monograph of H.G. Olsufyeva.

Later, V. Popov and A.P. Zuevsky enlarged the fauna of horseflies in the region with the following species: Chrysops sepulcralis F., *Tabanus glaucopis* Mg., *T. miki miki* Br., *Atylotus pallitarsis* Ols., *Hybomitra distinguenda* Verr., *H. nigricornis* Ztt., *Hexpollicata pand.* (=*Tabanus nigrivitta* Ols., Hybomitra *Heptatoma pellucens* F., *Haematopota turkestanica* Krob. Besides they have found *H. ciureai, H. muehlfeldi and H. montana morgeni* (Popov, 1959; 1962; 1965).

N.A. Violovich amended the faunal list with two species: *Hybomitra olsol* Tak. (=abanus angustatus Ols.) and *Haematopota tamerlani* Szil., detected in the eastern area (Violovich, 1966; 1967; 1968) Another species, *Chrysops rufipes* Mg., characterized by the fact that it is not a bloodsucker, was identified by 3.G. Sabirov in the Surgut District (Sabirov, 1970). Besides, he shows another finding: *Hybomitra pavlovskii* Ols., in the village Mamontovo in accordance with the collections of V.P.Dryomova. In the area of the Samotlor oil deposit N.M. Krylova found the *H. tarandinoides* Ols (Krylova, 1974). The works of other researchers have confirmed or expanded the ranges of already known species and it will be indicated later.

The faunal list of horseflies of the Tyumen region having 43 species and subspecies, can be amended by three more species. (Sivkova et al. 2017) So, 40 km. from the eastern border of the Omsk region K.S. Rastegayeva found *Chrysops wanderwulpi* Krob. (Rastegaeva, 1960), and 80 km., in the Alexanderov district of Tomsk oblast N.P. Gomoyunova found *Ch. Concavus* Lw. (Gomoyunova, 1966), which was also detected in the European territories of Russia by Y. G. Mitrofanova (Mitrofanova, 1951, 1955). The range of the third species, *Ch. Pictus* Mg. is registered both in the European and eastern parts of the Western Siberia. Our studies in the Khanty-Mansiysk, Nizhnetavdinsky, Yarkovsky and Tyumen regions revealed 352 species of horseflies. We failed to detect the following species: *A. Sublunaticornis, H. sexfasciata, H. olsoi, H. astuta, H. aequetincta, H. tarandinoides, H. pavlovskii, H. tamerlani*, which ranges were not registered in the locations of our data collections, as they are representatives of the northern or eastern fauna. But we managed to expand the ranges of nine species: the range of *Tabanus glaucopis, T. bromius, T. miki* was expanded to the North up to the middle taiga, *Hybomitra montana morgani* and *H. expollicata* expanded to South taiga, *Atylotus pallitarsis* and *Haematopota turkestanica* expanded to aspen-birch forests and the range borders of *Hybomitra tarandiba* were moved to the South to aspen-birch forests. It was the first time we registered a *Chrysops rufipes* in the South of the region. The spread of horseflies in the region, according to the literature and our research, is presented in Table 1.

Table 1. The species composition and spread of horseflies in the Tyumen region.

Species	**Tundra**	**Forest-tundra**	**Forest zone**				
			Northern taiga	**Average taiga**	**Southern taiga**	**Aspen and birch woods**	**Forest-steppe**
1	2	3	4	5	6	7	8
Tabanidae-horseflies							
Tabanidae-gadflies family							
Chrysopsinae							

Chrysopsinae subfamily							
Chrysops Mg.							
Ch.sepulcralis F.	-	-	X	X	X+	X+	-
Ch.nigripes Ztt.	X	X	X	X+	X+	X+	-
*Ch.divaricatus Lw.**	-	X	X	X+	X+	X+	X
*Ch.caecutiens L.**	-	-	X	X	X+	X+	X
*Chrelictus Mg.**	-	X	X	X+	X+	X+	X
Ch.rufipes Mg.	-	-	-	X	-	+	-
Tabaninae Tabanus L.							
*T.glaucopis Mg.**	-	-	-	+	X+	+	X
*T.maculicornis Ztt.**	-	-	X	X+	X+	X+	X
T.miki miki Br.	-	-	-	+	X+	X+	X
*T.bromius bromius L.**	-	-	-	+	X+	X+	X
*T.bovinus L.**	-	-	X	X+	X+	X+	X
*T.autumnalis autumnalis L.**	-	-	X	X+	X+	X+	X
Atylotus O.S.							
*A.fulvus Mg.**	-	-	X	X+	X+	X+	X
A.pallititarsis Ols.	-	-	-	-	=	+	X
*A.rusticus L.**	-	-	-	-	X+	X+	X
A.sublunaticornis Ztt.	-	-	X	-	-	-	-
Hybomitra End.							
H.kaurii Chv. Et Lyn.	-	-	-	X+	X+	X+	-
*H.sexfasciata Hine**	X	X	X	-	-	-	-
H.olsoi Tak.	-	-	-	X	-	-	-
*H.lapponica Wahibg.**	-	X	X	X+	X+	X	-
H.astuta O.S.	-	X	X	-	-	-	-
H.arpadi Szil.	-	X	X	X+	X+	X+	X
H.pavlovskii Ols.	-	-	-	X	-	-	-
H.tarandina L.	-	X	X	X+	X+	+	-
H.tarandinoides Ols.	-	-	-	X	-	-	-
H.aequetincta Beck	X	X	X	X	-	-	-
*H.lurida Flln.**	X	X	X	X+	X+	X+	X
*H.nitidifrons confiformis Chv. M.**	X	X	X	X+	X+	X+	X
H.distingueda Verr.	-	-	-	-	X	X+	X
*H.ciureai Seg.**	-	X	X	X+	X+	X+	X
*H.muehlfeldi Br.**	-		X	X+	X+	X+	X
*H.bimaculata Macq.**	-	X	X	X+	X+	X+	X
*H.nigricomis Ztt.**	-	X	X	X+	X+	X+	X
*H.lundbecki kundecki lyn.**	-	X	X	X+	X+	X+	X
*H.montana montana Ng.**	X	X	X	X+	X+	X+	X
*H.montana morgani Surc.**	-	-	-	-	+	+	X
*H.expollicata expollicata Pand.**	-	-	-	-	+	X+	X
Heptatoma Mg.							
H.pellucens pellucens F.	-	-	-	X	X+	X+	-
Haematopota Mg.	-	-	-	-	-	-	-
*Hm.turkestanica Krob.**	-	-	-	-	-	+	X
*Hm.Pluvialis pluvialis L.**	-	X	X	X+	X+	X+	X

Hm.subcvlindrica Pand	-	-	X	X+	X+	X+	X
Hm.Crassicomis Wahlbg.	-	-	-	-	X+	X+	-
Hm.tamerani Szil.	-	-	-	X	-	-	-
Total:	6	17	25	33	32	35	27

Note: vectors of agents of different diseases. X-literature data; +-own research.

In the typical tundra, horseflies are almost absent (Mirzaeva et al., 1984; Olshvang, 1980; Sazonova, 1949). In the shrub tundra they are likely to be found. Thus, on the reindeer pastures in the Nadym tundra 6 species are registered, including 1 species of the g. Chrysops and 5 species of g. Hybomitra. The dominant species were *H. aequetincta, H. nilidifrons, H. m. montana*. In the forest tundra there are 17 species of horseflies, of which 3 species belong to the g. Chrysops, 13 belong to g. Hybomitra and 1 belongs to g. Hematopota. On reindeer pastures, according to V.A. Shchepetkin, *H/m/montana, H. nitidifrona, Ch. nigripes* were dominant in the northern Nadym forest-tundra (Schepetkin, 1974). In the forest tundra near Salekhard and Labytnangi, including in cattle pastures*, N. sexfasciata* and *N. aequetincta* were the most widespread. 25 species of horseflies were detected in the northern taiga: 5 species of g. Chrysops, 2 species of g. Tabanua, 2 of g. Atylotus, 14 species g. Hybomitra and 1 species of g. Haematopota. Here there are all species characteristic for tundra and forest-tundra, and seven more species for which the northern taiga is the northern limit of distribution. Two species, *H. astuta, H. sexfasciata*, have here the south border of the range. In the western area of the subzone in the Polar Urals, on reindeer pastures *H. arpadi, H. m.nontana* were dominant*, H. sexfasciata, H. nitidifrons, H. lundbecki* were numerous. In the eastern part near the villages Krasnoselkup and Tolka in the vicinity of animal farms and cattle pastures the most numerous were *H. lundbecki, H. lurida, H.m. mobtana, N. arpadi, H. nitidifrons, Ch. nigripes*. But according to V.P. Polyakov among the attacking blood-sucking flies, horseflies bring the greatest harm to deer, as they suffer endemic necrobacillosis when the population of horseflies is at its peak (Polyakov, 1985). According to the literature data, horseflies are recorded in the middle taiga. We have additionally revealed three species. Currently, 33 species of six genera are known here, the breakdown looks like: the genus Chrysops counts 6, Tabanus-6, Atylotus-1, Hybomitra-16, Heptatonia-1, Haematopota-3 species. The middle taiga is the southern border for *H. aequetincta* and the northern border for *Ch. rufipes, T. glaucopis, T. bromius, T. bovinus, T. miki, H. kaurii, H. pellucens. H. olsoi, H. tarandinoides, Hm. tamerlani*, found in the eastern part of the subzone have here the westernmost point of their ranges. We have identified 24 species of horseflies on cattle pastures in the lower reaches of the Irtysh (Table 2). Dominant were *H. lundbecki, H. ciureai, H. nitidifrons, Hm. pluvialis*, numerous were *H. bimaculata, T. bovinus*, amounting to 92.31% of the total collection. Other recearcher also name *H. arpadi, H. lapponica* as the most dominant, in Surgut and Nizhnevartovsk the most dominant were *H. lurida, H. tarandina, H. kaurii, H.m. montana, A. Fulvus, Ch. relictus*, moreover, on cattle pastures, more disturbing for animals are the largest species, *T. bovinus* and *H. tarandina*. In total, in the subzone of the middle taiga, 13 species are noted as dominant and numerous, the ratio of which may vary depending on the season, but during one season their number is no more than 4-7 species.

Table 2. Relative quantity and abundance of horseflies in the taiga subzone (Khanty-Mansiysk district).

Species	Collected horseflies	Domination index (ID), %	Abundance degree
Ch.nigripes	1	0.03	+
Ch.divaricatus	7	0.19	+
Ch.relictus	24	0.66	++
T.glaucopis	1	0.03	+
T.maculicornis	1	0.03	+
T.miki	1	0.03	+
T.bromiua	3	0.08	+
T.bovinus	227	6.29	+++
T.autumnalis	10	0.28	+
A.fulvus	2	0.05	+
H.H.kaurii	1	0.03	+
H.lapponica	61	1.69	++
H.arpadi	67	1.86	++
H.tarandina	23	0.64	++
H.lurida	68	1.88	++
H.nitidifrons	490	13.57	++++
H.ciureai	894	24.77	++++
H.muehlfeldi	5	0.14	+
H.bimaculata	132	3.66	+++
H.nigricornis	2	0.05	+
H.lundbecki	1173	32.49	++++

H.m.montana	13	0.36	+
Hm.qluvialis	380	10.53	++++
Hm.subcylindrica	24	0.66	++
TOTAL:	3610	100	

Note: Here and in the following tables, the species abundance is presented as: ++++-mass or dominant; +++ - numerous or subdominant; ++-numerically insignificant; +-rare.

In the southern taiga, according to literary data, 30 species of horseflies have been identified. Our research added to the list two more species: *H.m. morgani* and *H. expollicata*. In total, there are 32 species of six genera in the subzone of the southern taiga: genera Chrysops inclused 5 species, Tabanus-6, Atylotus-2, Hybomitra 15, Heptatoma-1 and Haemwtopota-3 species. Southern taiga is the northern border for ranges of *A. rusticus, H. distinguenda, H.m. morgani, H. expollicata, H. crassiconis*.
In the southern taiga we have recorded horseflies of 31 species (Table 3). Among the well-known, we failed to detect one species *H. distinguenda*. According to the results for all the years, there were 5 types of dominant horseflies: *H. ciureai, H. lundbecki, H. bimaculata, H. muehfeldi, Hm. pluvialis*, and 2 species were numerous: *T. bromius* and *H. nitidifrons*, which in total amounted to 92.48%. Depending on the season and location of research, the percentage ratio of species significantly varies, and therefore, according to the index of dominance, dominant species fall into the category of numerous (*H. ciurwai, H. lundecki*), or even numerically insignificant (*H. muehlfeldi, Hm. pluvialis*), and small and even rare species become numerous (*Ch. divaricatus, T. miki. T. bovinus, A. fulvus, H. arpadi, H.m. montana, Hm. subcylindrica*). In total, in different seasons, 14 species were dominant and numerous, and during one season their number is from 6 to 7.
In addition such species as *Ch. divaricatus, T. miki, T. bovinus, H. lundbecki, H.m. montana, Hm. pluvialis, Hm. subcylindrica* are characteristic for floodplains of big rivers, and *T. maculicoris, A. fulvus, H. arpadi, H. nitidifrons, H. bimaculata* are more characteristic for forest areas, where the populations of these species are more numerous.

Table 3. Relative quantity and abundance of horseflies in the southern taiga subzone (Nizhnetavdinsk district, Yarkovsky district).

Species	**Collected horseflies**	**Domination index (ID), %**			**Abundance degree**
		Average	**Min**	**Max**	
2	3	4	5	6	7
Ch.sepuloralis	3	0.01	0	0.03	+
Ch.nigripes	4	0.01	0	0.03	+
*Ch.divaricatus**	347	0.24	0.01	2.11	+
Ch.caecutiens	25	0.02	0.01	0.07	+
Ch.relictus	105	0.1	0.01	0.8	+
T.glaucopis	145	0.14	0.01	0.36	+
T.maculicornis	356	0.35	0.02	1.73	+
*T.miki**	548	0.54	0.02	2.16	++
*T.bromius**	2489	2.48	0.57	6.76	+++
*T.bovinus**	945	0.94	0.07	2.83	++
T.autumnalis	225	0.22	0.06	0.94	+
*A.fulvus**	1039	1.04	0.04	3.53	++
A.rusticus	443	0.44	0.02	1.59	+
H.kaurii	43	0.04	0.01	0.11	+
H. lapponica	4	0.01	0	0.04	+
*H.arpadi**	841	0.84	0.02	4.91	++
H.tarandina	30	0.03	0	0.07	+
H. .lurida	324	0.32	0.04	0.91	+
*H..nitidifrons**	2056	2.05	0.52	3.27	+++
*H..ciureai**	24920	24.89	7.86	38.34	++++
*H.muehlfeldi**	10876	10.86	1.03	20.27	++++
*H.bimaculata**	18290	18.27	1.44	64.75	++++
H.nigricornis	112	0.11	0.03	0.18	+
*H.lundbecri**	20283	20.26	3.72	63.73	++++
*H.m.montana**	1350	1.35	0.04	3.89	++
H.m.morgani	3	0.01	0	0.01	+
H.expoliicata	5	0.01	0	0.02	+

H.pellucens	19	0.02	0.01	0.03	+
*Hm.pluvialis**	13683	13.67	0.64	58.83	++++
*Hm.subcylindrica**	678	0.68	0.17	2.07	++
Hm.crassicornis	16	0.01	0	0.03	+
Total	100107	100	-	-	

Note: *-mass and dominant species in different seasons.

In the subzone of deciduous aspen-birch forests, according to literary data, there are 29 species of horseflies. We have detected 34 species. 6 species, new for the subzone, were: *Ch. rufipes, T. glaucopis, A. pallitarsis, H. tarandina, H.m. morgant, Hm. turkestanica*, but one species was not detected-*H. apponica*. Currently the subzone counts 35 species of six gender, the breakdown in the following: genus Chrysops-6, g. Tabanus-6, g. Atylotus-3, g. Hybomitra-g. Heptatoma-1, g. Haematopota-4 species. Deciduous forests are the southern border for the ranges of *Ch. sepulcralis, Ch. nigripes, Ch. rufipes, H. tarandma, H. kaurii, H. pellucene* and northern border for *A. pallitarsis* and *Hm. turkestanica*.

Dominant in accordance with our data in Tyumen region were *H. ciureai. H. lundbecki* and *Hm. puvialis*, numerous were *T. bromius, H. muhlfeldi H. bimaculata, Hm. subcylindrica*, amounting in total up to 92.65% (Table 4). Remaining 27 species were numerically insignificant and rare. In some seasons, *H. muehlfeldi*, *H. bimaculata* and *Hm subcylindrica* became massive, and *T. autumnalis, H. nitidifrons, H.m. montana* were numerous (Pavlova et al., 2012).

According to V.V. Popov, the most dominant species in this subzone are *H. ciureai, H. bimaculata. H. tnuehlfeldi, H. lundbecki, Hm. pluvialis* is numerous (Popov, 1959, 1962, 1965). V.I. Bukshtynov adds to the above mentioned dominant also *H. nitidifrons* species, and to numerous he adds *T. miki, A. fulvus, H. lurida, H. nigricornis* (Bukshty, 1962, 1966). In total, among the most numerous, according to our literary data, there are 13 species, and within one season from 5 to 11 species. In the forest-steppe zone, the fauna of horseflies, according to the literature, is represented by 27 species of five genera, including by genera: Clirysops-3, Tabanus-6, Ftylotus-3, Hybomitra – 12, Haematopota 3 species.

Table 4. Relative quantity and abundance of horsefly in the subzone of deciduous aspen-birch forests (Tyumen region).

Species	**Collected horseflies**	**Domination index (ID), %**			**Abundance degree**
		Average	**Min**	**Max**	
2	3	4	5	6	7
Ch.sepulcralis	11	0.03	0	0.05	+
Ch. nigripes	1	0.01	0	0.01	+
Ch. divaricatus	16	0.04	0.01	0.07	+
Ch. caecutiens	9	0.03	0	0.04	+
Ch. relictus	109	0.31	0.03	0.43	+
Ch. rufipes **	24	0.07	-	-	+
T.glaucopis	13	0.04	0	0.1	+
T. maculicornis	192	0.55	0	0.95	++
T. miki	25	0.07	0.01	0.21	+
T. bromius *	2407	6.9	3.2	7.04	+++
T . bovinus	428	1.23	1	1.9	++
T. autumnalis *	423	1.21	0.85	2.16	++
A. fulvus	152	0.44	0.1	0.52	+
A. rusticus	216	0.62	0.18	1	++
A. pallitarsis	3	0.01	0	0.01	+
H.kaurii	2	0.01	0	0.01	+
H. arpadi	9	0.03	0.01	0.08	+
H. tarandina	2	0.01	0	0.01	+
H. lurida	45	0.13	0.01	0.27	+
H. nitidifrons *	355	1.02	0.09	2.1	+
H. distinguenda	14	0.04	0.01	0.08	+
H. ciureai *	10974	31.48	27.51	32.63	++++
H. muehlfeldi *	1369	3.93	1.4	8.27	+++
H. bimaculata *	2579	7.4	4.74	8.82	+++
H. nigricornis	52	0.15	0.02	0.48	+
*H. lundbecki**	6230	11.87	5.95	35.21	++++
*H.m. montana**	449	1.29	0.5	2.31	++

Tm. morgani	1	0.01	0	0.01	+
H. expollicata	4	0.01	0	0.02	+
H.pellicens	2	0.01	0	0.01	+
*Hm.pluvialis**	7750	22.23	17.52	37.5	++++
*Hm.subcylindrica**	990	2.84	1.8	10.24	+++
Hm.crassicornis	1	0.01	0	0.01	+
Hm.turkestanica	1	0.01	0	0.01	+
TOTAL:	34858	100	-	-	

Note: *-mass and dominant species in different seasons; **-from pupae.

On cattle pastures, according to V.I. Bukshtynov, dominant species were H. *Ciureai, H. Lundbecki, H. Bimaculata, Hm. pluvialis*, numerous are *Cli. relictus, T. Miki, T. Bromius, T. Bovinus, T. Autumnalis, H. Nitidifrons, H. Muehlfeldi, H. Nigricornis, Hl.m. montana, Hm. subcylindrica*, amounting in total up to 94.56% of the 22 species identified by the author, 14 were dominant and numerous during one season, practically, the species dominant here were those same to the species in the subzone of deciduous forests.

In general, the region has equal destribution of horseflies. While moving from the North to the South, fauna enrichment is to be seen: from 6 species in the area of shrub tundra to 35 in the southern part of the forest zone.

When determining horseflies, we, other researchers alike, observed individual changes in the color of the abdomen of some species. The reduction of quantity of brown points and sometimes full replacement by black coloring was observed. In the middle and southern taiga we have detected dark forms of two species: *H. montana montana* var.flaviceos Zett. and *H. montana* var.bisignata Jaenn. However, such individuals were rare. It is more characteristic for northern regions.

Zoogeographically, the fauna of horseflies in the Tyumen region being a part of the European-Siberian subregion of the Palaearctic region, is not uniform and is represented by species of tundra to desert faunal complexes. The faunal complexes, its geographical or landscape variant of different species is given in accordance with works of N.G. Olsufyev, who understands under the "faunal complex" term a group of species having similar ranges. In any complex he defines different variants. Thus, the species, the ranges of which are typical for this faunal complex, are assigned to the nominative variant, while the species with evading ranges are identified in the variants corresponding to their geographical or landscape associated boundaries. Based on taxonomic and landscape relations and considering the fauna of horseflies on the territory of the former USSR he combined the faunal complexes in 4 subregional types of fauna, two of which are on the territory of Tyumen region-Bor-Eurasian and Afro-Eurasian arid. The zoogeographic characteristics of horseflies and their abundance in different zones and subzones of the region are given in Table 5.

Table 5. The zoogeographic characteristics of horseflies of Tyumen region and their abundance in different nature zones and spread over the territory of Russia (according to literature and own research).

Variant of faunal complex	Species of horseflies	Zones and subzones							Group of range of a species in Russia
		Tundra	Forest Tundra	Northern Taiga	Middle Taiga	Southern Taiga	Deciduous Forest	Forest Steppe	
Bor-Euroasian fauna type									
Tundra faunal complex									
Nominative	*H. astuta*		++	+					1
	H. aequetincta	+++	++++	++	+				1
Tundra-taiga	*H. sexfasciata*	+++	+++(+)	+++	+				1
Taiga faunal complex									
Nominative	*Ch.nigripes*	+++(+)	++++	++++	++	++	+		1
	Ch.divaricatus		+	+	+	+	+	+	1
	H.lapponica		++	++(++)	++(++)	+	+		1
	H.arpadi		+++(+)	+++(+)	++(++)	++(++)	+	+	1
	H.tarandina		+	+	++(++)	+	+		1
	H.nigricomis		+++	+++	+	+(+)	+(++)	+++	1
Taiga-forest	*A.sublunaticomis*			+					1
	H. lurida	+++	++++	+++(+)	++(++)	+(+)	+(++)	++	1
	H.nitidifrons	+++	+++(+)	+++	+++(+)	+(++)	++(++)	+++(+	3

							)	
	H.muehlfeldi		+	+	+	+++(+)	+++(+)	++ +	1
	H.bimaculata		+	+	+++(+)	++++	+++(+)	++ ++	1
	H.lundbecki		+	+++(+)	++++	++++	++++	++ ++	3
	H.m.montana	+++ +	+++(+)	++++	++(++)	+(++)	++(+)	++ +	1
East-Siberian taiga	*H.olsoi*				+				4
East-Siberian taiga-forest	*H.pavlovskii*				+				4
Europe-Siberian forest faunal complex									
Nominative	*Ch.sepulcralis*			+	+	+	+(+)		3
	Ch.caecutiens			+(+)	+(+)	+	+(+)	+	2
	T.glaucopis				+	+	+	+	2
	T.maculicomis			+	+	+(+)	++	++	3
	T.miki				+	+(+)	+(++)	++ +	2
	T.bovinus				+++	++(+)	++	++ +	2
	T.fulvus			+	+(++)	++(+)	+(++)	+	2
	H.kaurii				+	+	+		2
	H.distinguenda					+	+	+	2
	H.pellucens				+	+	+		3
	Hm.pluvialis		+	++	+++(+)	++(+)	++++	++ ++	2
	Hm.crassicomis					+	+		3
East-Siberian forest faunal complex									
Nominative	*H.tarandinoides*				+				4
	H.tamerlani				+				4
Forest-steppe faunal complex									
Nominative	*Ch.relictus*		+	++(+)	++(+)	+(+)	+(+)	++ +	2
	Ch.rufipes				+		+		3
	T.bovinus				+	++(+)	+++	++ +	3
	H.ciureai		+	+	++++	++++	++++	++ ++	2
	T.autumnalis			+	++	+(+)	++	++ +	3
	A.rusticus					+(+)	+(+)	+	3
	Hm.subcy lindrica			+	++	+(++)	+++	++ +	3
Afro-Eurasian arid fauna Steppe faunal complex									
Nominative	*H.m.morgani*				+	+	+	+	2
	H.expollicata					+	+	+	3
Siberia-Mongolian	*A.pollitarsis*						+	+	4
Desert faunal complex									
Nominative	*Hm.turkestanica*						+	+	3

Note: +++(+)- the species can be massive and dominant; ++(+)-species can be dominant and numerically insignificant etc; Group of species range in Russia: 1-European part, Western, Eastern Siberia, the Far East; 2-European part, Western and Eastern Siberia; 3-European part and Western Siberia; 4-West, Eastern Siberia, the Far East

Bor-Eurasia type of fauna includes more than 90% of species that are representatives of the tundra, taiga, European-Siberian forest, East Siberian forest and steppe faunal complexes, that is, of complexes characteristic of the landscape of the region. The Afro-Eurasian arid type of fauna, represented by steppe and desert faunal complexes, has less than 10% of species.

The largest number of species belongs to the taiga faunal complex (15 species), and the taiga-forest species are numerous and have a wide intra-zonal spread. Europ-Siberia forest faunal complex takes the second place in terms of the quantity of species (12 species). Representatives of this complex are less numerous and their ranges are limited mainly by the forest and forest-steppe zones. The next in species diversity ranks the forest-steppe faunal complex, whose representatives are also few (except for *H. ciureal*) and their ranges are mainly adjusted to the southern part of the region. The East-Siberian taiga and forest species of this type of fauna are limited by the middle taiga, namely the floodplain of the Ob river, in its eastern part, and the findings of these species are rare.

Representatives of the Afro-Eurasian arid type of fauna, which are not characteristic for the landscape of the region, are rare and their findings are rare. By the nature of the spread in the territory of the region in the latitudinal aspect (from the North to the South), horseflies do not represent a single uniform group and differ in varying degrees of adaptation to the conditions of the north. Wider adaptive abilities of horseflies is observed in the species of faunal complexes of northern latitudes, which can be explained by the wider range of fluctuations of abiotic factors of the external environment. Dominant and numerous on the territory of the region are those types of horseflies that have a wide range, that is, they are found intra-zonally. These are mainly taiga, taiga-forest and some forest-steppe species.

All types of horseflies found in the Tyumen region are widespread in Russia, which is due to the fact that the main natural zones, such as the tundra, the forest tundra and the forest zone, cover a large territory from its western to eastern borders. Depending on the size of the range in the longitudinal direction (from the West to the East), horseflies present in the Tyumen region can be divided into 4 groups: 1) species found in the European part of Russia, Western and Eastern Siberia and the Far East; 2) species found in the European part, Western and Eastern Siberia; 3) species found in the European part and Western Siberia; 4) species found in Western and Eastern Siberia and the Far East (see Table 5).

The first group includes 14 species and takes 32.6% of the region's fauna, they belong to tundra (3 species) and taiga (11 species) faunal complexes, while seven of them are also found in the Nearctic Region of the Holarctic Superregion, that is, they are Holarctic species (*Ch. nigripes, H. sexfasciata, H. japponica, H. arpadi, H. astuta, H. aequetincta, H. jurida*). Among the species of this group 11 (78.5%) are dominant or subdominant in oner or multiple zones or subzones of the Region.

The second group includes 11 species (25.6%), mainly related to the European-Siberian forest (8 species), as well as the forest-steppe (2 species) and steppe (1 species) faunal complexes. 6 species (54.5%) are dominant or subdominant among them.

The third group includes 13 species (30.2%), including European-Western Siberian taiga-forest (2 species), European-Western Siberian forest (4), European-Western Siberian forest-steppe (5), species, and also representatives of the steppe (1) and desert (1) faunas. In this group, 5 species (38.5%) are dominant or subdominant in one of the zones or subzones of the region.

The fourth group includes 5 species (11.6%), which are representatives of East Siberian taiga (1 species), East Siberian taiga-forest (1), East Siberian forest (2) and Siberian-Mongolian steppe (1 species) fauna. All these species in the region are rare, as they are found on the border of their ranges.

It is worth mentioning, that the Ural Mountains are the eastern boundary of the range only for three European forest species (*T. cordiger* Mg., *T. sudeticus sudelicus* Zell, and *Hm. italica* Mg.).

These data show that the fauna of horseflies of the Tyumen region has much in common with other regions of Russia. Thus, 88.4% of species of Tyumen region are same to those in the European part and Western Siberia, 69.8% of the species are same to those in Eastern Siberia, and 44.2% are same to those in the Far East. The largest number of common species is noted in the first and second groups of horseflies having the largest range extending from the western borders of Russia to the Far East and Eastern Siberia.

Of the 43 species and subspecies of horseflies found in the region, 24 are vectors of agents of various human and animal diseases (see Table 1). The ratio of the total number of species encountered and vectors was 1.8: 1, which corresponds to the same value in the Karelian Republic, also located in the forest zone, but significantly exceeds (6: 1) the value of the former USSR. Mostly, horseflies are mechanical vectors of agents. In the Tyumen region, 12 species of horsefly are vectors of anthrax agents, 8 species-of tularemia, 8 species-anaplasmosis, 6 species-trypanosomiasis, 3 species-of infectious anemia of horses, 3 species-of emphysematous carbuncle, 3 species-of necrobacteriosis, 3 species-of necrosis, 1 species-of tick-borne encephalitis, 1 species-of leptospirosis, 1 species-of retariosis. Besides, horseflies apparently play a role in the epidemiology of Lyme disease widespread in Russia, the causative agent of which was found in the United States in 11 species out of 12 studied (Hasselschwert, 1993; Magnarelli, 1986) Due to widespread cattle leukemia in the Region It should be noted that horseflies are potential vectors of leukemia virus (Buxton, 1985; Foil, 1988; Jhshima, 1981; Lyneborg, 1959). Transmission of the virus has been proven in the USA experimentally on bites of 50-250 Tabanus fuscicostatus Hine females. The role of horseflies as potential vectros of disease agents increases significantly on pastures, where there is a higher concentration of these insects around animals(Martins-Neto, 2003; De Liberato C, 2019; Odeniran, 2018; Chainey, 1993). The severity of the situation increases when there are sick animals in the herd.

Conclusion

Zoogeographically, the types of horseflies found in the Tyumen region belong to two types of fauna-the Bor-Eurasian and Afro-Eurasian arid. The Bor-Eurasiysky type comprises more than 90% of species and is represented by five faunal complexes: tundra, taiga, European-Siberian forest, East Siberian forest and forest-steppe. The Afro-Eurasian arid type, accounting for less than 10% of species, is represented by two faunal complexes: steppe and desert. The most widespread are taiga, Euro-Siberian forest and forest-steppe species, which show a intra-zonal distribution. The horseflies' species found in the Tyumen

region are widespread in Russia. The ranges of 14 species cover the entire territory of the forest zone from its western to eastern borders, 11 species take the European part, Western and Eastern Siberia, 5 species are spread in Western and Eastern Siberia and the Far East. The greatest similarity in species composition is determined with the European part and other regions of Western Siberia. They have 38 species in common. 30 species are common with those in Eastern Siberia, and 19 species are the same to those in the Far East.

Acknowledgements

Article is prepared with financial support of FNI (No. 0371-2018-0040) "Monitoring of an epizootic situation and forecasts of development of possible outbreaks of parasitic diseases of animals".

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Citation: Pavlova, R.P., Sivkova, E.I. (2019). Faunal overview of horseflies (Diptera, Tabanidae) of Tyumen region. Ukrainian Journal of Ecology, 9(2), 57-67.