

Fauna of Biting Midges (Diptera: Simuliidae) in Russia

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ABSTRACT

Blood-sucking midges of the family Simuliidae are small two-winged insects from the suborder of long-whiskers (Diptera: Nematocera). They are widely distributed in all landscape-geographical zones of the Russian Federation and have important medical and epidemiological significance as hematophagy and vectors of human and animal diseases. The hydrological regime of the watercourse and biotopic factors determine the species composition and number of midges developing in the watercourse, as well as the blood-sucking activity of the flown females. The paper presents data on the species diversity of blood-sucking midges, by region, currently about 1600 species of midges belonging to 81 genera are known in the world fauna, and the question of the ecological properties of insects depending on the climatic features of habitats is raised. Presently, systematic studies of the areas and population density of the main vectors of infection on the territory of the Russian Federation are not carried out or are carried out only in some individual regions, which makes it much more difficult to assess the risk of introduction and spread of infections. Due to global warming, there is a possibility of penetration of the most plastic species of blood-sucking arthropods into the northern regions, which will have a direct impact on the epidemiology and epizootology of vector-borne diseases. This includes regular study of biota diversity, identification of changes, comparing them with shifts in environmental parameters, analysis of changes, conclusions on necessary measures to preserve biodiversity, and identifying the impacts of global changes on biota.

Keywords: Biting midges, Release, Fauna, Affinity of species composition.

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INTRODUCTION

Midges are one of the components of insects of the "gnus" complex. Simuliids are widespread in all landscape-geographical zones of the Russian Federation and are of great medical and epidemiological significance as hematophagy and vectors of human and animal diseases. Currently, systematic studies of the ranges and population density of the main carriers of infection in the Russian Federation, unfortunately, are not carried out or are carried out only in some individual regions, which greatly complicates the assessment of the risk of introduction and spread of infections. In connection with the ongoing processes of global warming on the planet, there is a possibility of

the penetration of the most plastic species of blood-sucking arthropods into the northern regions, which will have a direct impact on the epidemiology and epizootology of vector-borne diseases [1, 2]. The International Convention on Biological Diversity, adopted at a special conference of the UN General Assembly in 1992 in Rio de Janeiro, includes a requirement to ensure the monitoring of biodiversity at the national and international levels. The article summarizes the available materials of publications on blood-sucking midges, common in Russia, and their role as carriers of pathogens. Biting midges of the family Simuliidae are small two-winged insects from the *Nematocera* suborder. The preimaginal stages develop under conditions of favorable oxygen and hydrological

conditions in fast-flowing rivers and streams, using aquatic macrophytes, leaf litter, stones, and artificial substrates as attachment substrates. The hydrological regime of the watercourse and biotopic factors determine the species composition and number of midges developing in the watercourse, as well as the blood-sucking activity of emerging females [3].

Midges are one of the components of insects of the "gnus" complex. Simuliids are widespread in all landscape-geographical zones of the Russian Federation and are of great medical and epidemiological significance as hematophages and vectors of human and animal diseases. Currently, systematic studies of the ranges and population density of the main carriers of infection in the Russian Federation, unfortunately, are not carried out or carried out only in some individual regions, which greatly complicates the assessment of the risk of introduction and spread of infections. In connection with the ongoing processes of global warming on the planet, there is a possibility of the penetration of the most adaptive species of blood-sucking arthropods into the northern regions, which will have a direct impact on the epidemiology and epizootiology of vector-borne diseases [1, 2]. The International Convention on Biological Diversity, adopted at a special conference of the UN General Assembly in 1992 in Rio de Janeiro, includes a requirement to ensure the monitoring of biodiversity at the national and international levels. These include the regular study of biota diversity, identification of changes, their comparison with shifts in the values of environmental parameters, analysis of changes, conclusions about the necessary measures to conserve biodiversity, and identification of the impacts of global changes on biota [4]. In connection with all of the above, we have attempted to summarize the currently available publications on biting midges common in Russia and their role as carriers of pathogens. Currently, about 1600 species of midges belonging to 81 genera are known in the world's fauna [5]. Most of the studies on the fauna of biting midges in Russia were carried out in the second half of the 20th century; since then, there have been significant changes in the taxonomy of the family Simuliidae [5], therefore, in the table, which presents the species composition of biting midges according to the literature data, we give

modern names of species and genera, and in brackets - used earlier.

MATERIALS AND METHODS

In this paper, an analysis of our data, as well as literary data, is carried out, which speaks about the spread of blood-sucking midges and the medical and epidemiological significance of hematophages and vectors of human and animal diseases in the territory of Russia.

RESULTS AND DISCUSSION

The most complete faunistic list of biting midges in Western Siberia and the Ural is presented in the monographs of Rubtsova [6], Patrusheva [7], and Yankovsky [5]. For Western Siberia, Rubtsov [6] notes 18 species, according to Patrusheva [7] there are at least 40 species inhabiting the region. According to the research of Patrusheva [7] a typical form of *S. morsitans*, noted by Rubtsov, does not occur in Siberia, and therefore information on this species refers either to *S. longipalpe* Belt., or to any of the close forms, while the species is indicated as *S. Morsitans*.

The first information on the fauna of midges in the Tyumen region is presented in the monograph by Rubtsov [3] and their systematic study began in 1959 by employees of the Biological Institute of the Siberian Branch of the USSR Academy of Sciences (now the Institute of Animal Systematics and Ecology of the Siberian Branch of the Russian Academy of Sciences). During this period, fauna of the Tyumen region included all finds on the territory of the modern Yamalo-Nenets and Khanty-Mansi Autonomous Okrugs, and the south of the region. In this article, we divided the literature data on the species composition of midges according to the place of their discovery into these three independent regions.

The species composition of biting midges in the south of the Tyumen region was studied by Patrusheva *et al.*

In the suburbs of Demyanskoe Patrusheva [8] found 8 species: *Cnetha verna* Macq., *Byssodon maculatus* Mg., *Nevermannia angustitarsis* Lund., *Eusimulium aureum* Fries, *Schoenbaueria pusilla* Fries, *Odagmia ornate* Mg., *S. (morsitans) longipalpe* Edw., *Simulium rostratum* Lund., of which *B. maculatus* was the absolute dominant. In the Tyumen region, Bukshytynov [9] discovered

5 species of midges: *B. maculatus*, *Schoenbaueria nigra* Mg., *Boopthora erythrocephala* D.G., *Argentisimulium noelleri* Fried., *S. morsitans*. Mitrokhin as a result of research carried out in various natural and climatic zones of the south of the Tyumen region [10-12] discovered 11 species of midges, adding two species to the existing list - *Parabyssodon transiens* Rubz. and *Simulium reptans* L.

Patrusheva [7] added *S. longipalpe*, *Simulium venustum* Say. to the list of known species.

In 2003-2010, cases of detection of entomology and disinsection at the All-Russian Research Institute of Veterinary Entomology and Arachnology were revealed. As a result of the research, the faunistic list was filled with 1 species - *Schoenbaueria subpusilla* Rub. [13]. Thus, the fauna of midges of the family Simuliidae in the south of the Tyumen region includes 14 localities of 10 genera.

In the Khanty-Mansiysk Autonomous Okrug, the study of the fauna of biting midges was carried out only in the 60s-80s of the last century. Patrushev [7, 14] discovered 8 species in the suburbs of the village Oktyabrskoye: *Cnetha silvestris*, *Cnetha pugetensis* Dyar. et Schan., *C. verna*, *B. maculatus*, *S. pusilla*, *Argentisimulium (Simulium) palustre* Rubz., *S. (morsitans) longipalpe*, *S. rostratum*, of which *B. maculatus* and *S. pusilla*. Ishmuratov [15] registered 7 species of midges in the district, adding two species to the known list: *B. erythrocephala* and *S. venustum*. In the Surgut district of Novitskaya [16] 6 species of midges were previously discovered.

Zavyalov [17] recorded 3 species in the Surgut region, and Krylov [18] in the area of the Samotlor oil field - 6 previously known species. Zavyalov [17] recorded 3 species in the Surgut region and Krylov [18] in the area of the Samotlor oil field - 6 previously known species. In the suburbs of Nefteyugansk, 2 species prevailed: *B. maculatus* and *S. pusilla* [19]. When studying the breeding sites of midges, Mitrokhin [11] established another species, *P. transiens*, in the lower reaches of the Irtysh. Later, in 1974, Mitrokhin [12] noted 10 species for this region, of which three were identified for the first time - *S. nigra*, *S. morsitans*, *S. tuberosum*. In 1982 Patrusheva [7] added one more species to the list of midges living in the area - *Gnus malyschevi* Dorog, Rubz et Vlas. According to the literature

materials, the fauna of the biting midges of the Khanty-Mansiysk Autonomous Okrug is represented by 15 species belonging to 8 genera. The study of blood-sucking dipterous insects, including midges, on the territory of the Yamalo-Nenets Autonomous Okrug was mainly carried out during the exploration of new oil and gas fields in the second half of the 20th century. In the area of the village of Labytnangi, Patrusheva and Polyakova [20] established the habitation of 8 species: *B. maculatus*, *Schoenbaueria rangiferina* Rubz., *S. pusilla*, *Gnus corbis* Tw., *O. ornata*, *Archesimulium vulgare*, *S. (morsitans) longipalpe*, *S. rostratum*.

In the forest-tundra zone, Patrusheva [8] also notes 8 blood-sucking species of midges, while she believes that another 2 species registered by Rubtsov [3] for the north of Western Siberia: *Prosimulium hirtipes* Fries and *Schoenbaueria gigantean* should be included, which she did not find.

Predominant species, according to Patrusheva [8], are *S. pusilla* and *S. longipalpe*. Novitskaya [21], after conducting research in the forest-tundra of the Purovsky district, added 2 species to the faunistic list of blood-sucking midges in the district: *B. erythrocephala* and *S. venustum*. In 1972, Patrusheva discovered one species of midges in the Polar Urals - *Schoenbaueria tshernovskii*. Later Shchepetkin [22] registered the habitation of 1 more species in the area - *Simulium truncatum* Lund., in addition, the author found larvae of 4 more species in watercourses: *Cnephia pallipes* Fr., *Metacnephia tredecimata* Edw., *Cnetha bicornis*, and *C. verna*. In the suburbs of the village, Patrusheva [23] registered 2 previously registered species of midges, *C. pallipes* and *S. truncatum*.

Two years later, Patrusheva *et al.* [24] added three more species to the list of midges: *Metacnephia trigoniformis* Yank., *Metacnephia pectinata* Patr., *Metacnephia korsacovi* Rubz. Patrusheva [7] discovered 9 new species for the region: *Metacnephia edwardsiana* Rubz., *Metacnephia tabescentifrons* End., *E. aureum*, *C. silvestris*, *C. pugetensis*, *Parabyssodon transiens* Rubz., *Schoenbaueria brachyarthran* Rubz., *Simulium posticum* Mg. and *Archesimulium tuberosum* Lund. In the suburbs of the village Cape Kamenny, the Neito lake system and the middle course of the river. Boldarueva [25] discovered 6 additional species: *Prosimulium*

kolymensis Patr., *Stegopterna trigoni* Lund., *Cnetha arcticum* Rubz., *S. subpusilla*, *Archesimulium tumulosum* Rubz. and *S. tuberosum*.

Petrozhitskaya [26] in the northern forest-tundra of Yamal confirmed the presence of one species indicated by Rubtsov [3]. As a result of the analysis of literature data, it was found that the fauna of the biting midges of the Yamalo-Nenets Autonomous Okrug is represented by 40 species belonging to 16 genera.

In the Taimyr Autonomous Okrug, the midges' fauna is poorly studied. The most studied part of the district was the right bank of the Yenisei. As a result of studies carried out in 1965-1968 [27], 23 species of biting midges were identified: *Gymnopais trifistulatus* Rubz., *Prosimulium alpestre* Dor. et Rubz., *P. hirtipes* Fries, *P. arcticum* Rubz. et Carls., *Helodon irkutensis* Rubz., *Stegopterna trigoni* End., *S. duodecimata* Rubz., *S. sp.*, *Cnephia pallipes* Fries (*Cnephia lapponica* End.), *B. maculatus*, *Cnetha verna* Macquart (*Eusimulium latipes* Meigen), *Schonbaueria pusilla* Fries, *S. subpusilla* Rubz., *S. rangiferina* Rubz., *Gnus cholodkovskii* Rubz., *G. rostratum* Lundstr., *Simulium vulgare* Rubz., *S. Rostratum* Lundstrom (*Simulium argyreatum* Meigen), *S. morsitans longipalpe* Belt., *S. sp.* from the group *venustum* Say, *S. verecundum* St. et Jamnb., while some of the captured individuals were identified only to the genus - *Cnephia sp.*

The fauna of the European part of Russia is considered to be well-studied in the article by Medvedev [28].

The blackfly fauna of Karelia and the Murmansk region has been studied by many researchers [3, 29-31]. In total, according to Aibulatov and Baryshev [32] found 38 species from 10 genera. Collections were carried out in 7 districts of the Murmansk region and 12 districts of Karelia. For the Murmansk region, 15 species were identified: *Prosimulium macropuga* Lundstrom, *Helodon ferrugineus* Wahlberg, *Metacnephia biliniata* Rubz., *M. tredecimata* Edwards, *Wilhelmia eguina* Lannaeus, *Cnetha beltukovae* Rubz., *C. Bicornae* Dorogostajsky, Rubzov et Vlasenko, *C. cryophila* Rubz., *C. curvans* Rubz. et Carlsson, *C. Silvestris* Rubz., *Schonbaueria subpusilla* Rubz., *Odagmia argyreata* Mg., *O. Bronchialis* Rubz., *O. Laplandica* Chubarevae et Yankovsky, *O. Ornate* Mg., *Archesimulium tuberosum* Rubz., and 29 species in the Republic of Karelia: *Wilhelmia eguina*

Lannaeus, *Hellichella crassum* Rubz. (*Boreosimulium crassum* Rubz.), *Cnetha beltukovae* Rubz., *C. Bicornae* Dorogostajsky, *C. cryophila* Rubz., *C. elburna* Rubz. Et Carlsson, *C. meigeni* Rubz. et Carlsson, *C. silvestris* Rubz., *Cnetha verna* Macq., *Eusimulium angustipes* Edw., *Boophthora erythrocephala* D. G., *Gnus corbis* Twinn (*Gnus murmanum* End.), *Odagmia argyreata* Mg., *O. frigida* Rubz., *O. fusca* Rubz., *O. intermedia* Roubaud., *O. Laplandica* Chubarevae et Yankovsky, *O. monticola* Fiederichs, *O. Ornate* Mg., *O. rotundata* Rubz., *Archesimulium polare* Rubz., *Arch. tuberosum* Rubz., *Argentisimulium noelleri* Fried (*Simulium noelleri* Fried), *Simulium janzeni* End., *S. longipalpe* Belt., *S. morsitans* Edw., *S. paramorsitans* Rubz., *S. posticatum* Mg., *S. reptans* L., *S. rostratum* Lund., *S. rubzovi* Smart.

The entomofauna of the southeast of Karelia remained a blank spot for a long time, despite the undoubted interest in the easternmost region of Fennoscandia, this region occupies a border position at the junction of the Baltic Shield and the Andoma Upland. Research conducted by Humala A.E. and Polevoy A.V. (2009) identified the following species: *Gnus corbis* Twinn, *S. rostratum* Lund., *Cnetha bicornae* Dorogostajsky, Rubzov et Vlasenko, *C. verna* Macquart, *S. morsitans*, *S. reptans* L., and *Archesimulium tuberosum* Lund.

In Primorsky Krai, where the first information on the fauna and ecology of midges was published in the works of Gutsevitsya [33], Radzivilovskaya [34-36], Grunina [37], Rubtsova [3]. In subsequent years, no one was engaged in the study of midges in the Primorsky Territory. 24 species belonging to 9 genera were registered: *Gymnopais sp.*, *Helodon rubicundus* Rubz., *H. alpestris* Dorogostajsky, Rubzov et Vlasenko, (*Prosimulium alpestre* Dorogostajsky, Rubzov et Vlasenko), *H. multicaulis* Popov. (*P. multicaulis* Popov.), *Prosimulium macropuga* Lundstrom, *P. macropuga* Lundstrom, *P. hirtipes* Fries. (*P. Hirtipes diminutum* Rubz.), *P. Irritans* Rubz., *Stegopterna sp.*, *Cnephia pallipes* Fries (*Metacnephia pallipes* Fries), *Byssodon sp.*, *Eusimulium schogakii* Rubz., *E. Latipes* Mg., *E. Fontinale* Radz., *E. Bicorn* Dor. Et Rubz., *E. Pygmeum amurense* Rubz., *E. sp.*, *Gnus malyschevi albipes* Rubz., *G. rostratum* Lundstr., *G. subvariegatum* Rubz., *Simulium vulgare* Rubz., *Sim. tumulosum* Rubz., *S. venustum* Say, *S. morsitans* [38].

On the territory of the Volgograd region of the Lower Volga zone, biting midges are an insufficiently studied group of insects, according to Denisov and Ivantsov [39] identified five species of midges belonging to five genera: *Byssodon maculatus* Mg. (*Titanopteryx maculatus* Meigen), *Schoenbaueria nigra* Mg. (*Schoenbaueria behningi* End., *Schoenbaueria matthiesseni* Enderlein), *Odagmia ornate* Mg., *Boophthora erythrocephala* D. G., *S. morsitans*.

Studies on the zoobenthos of the rivers of the Kaliningrad region Gusev, Guseva, and Rudinskaya [40], 3 species of midges were identified: *Wilhelmia edulina* Linnaeus, *W. lineata* Mg., *Simulium* spp. Studies of midges in the territory of St. Petersburg and the Leningrad region were carried out at different times by Rubtsov, Usova, and Aibulatov. Thus, to date, 63 species of midges belonging to 17 genera have been recorded in the region, including such large ones as *Cnetha*, *Eusimulium*, *Odagmia*, *Prosimulium*, *Schoenbaueria*, and *Simulium* [8]. To date, midges are known in the region from 54 collection points. Rubtsov [3] noted 17 species from 10 genera without specifying collection points on the territory of the Leningrad Region: *Cnephia pallipes* Fries (*Metacnephia pallipes* Fries), *C. meigeni* Rubz. et Carlsson, *Eusimulium angustipes* Rubz., *E. Aureum* Rubz., *E. securiforme* Rubz., *Hellichella annae* Rubz., *H. annulus* Lundstrom, *Nevermannia latigonia* Rubz., *Prosimulium luganicum* Rubz., *Schoenbaueria subpusilla* End., *Simulium janzeni* End., *S. longipalpe* Belt., *S. paromorsitans* Smart, *S. rubzovi* Smart, *S. truncatum* Lundstrom, *Stegopternatrigonia* Rubz., *Wilhelmia ivashentzovi* Rubz.

In the research of Usov [41] devoted to midges of the Leningrad region, 48 species from 15 genera are noted. For the first time in the region, Usova notes 37 species: *Archesimulium tumulosum* Rubz., *A. Tuberosum* Lundstrom (*Simulium tuberosum* Lundstrom), *A. Vulgare* Dorogostajsky, Rubzov et Vlasenko (*Simulium vulgare* Dorog., Rubz. et Vlas.), *Agentisimulium noelleri* Rubz., *Boophthora erythrocephala* D. G., *Cnetha beltukovae* Rubz., *C. bicorne* Dorogostajsky, Rubzov et Vlasenko, *C. cryophila* Rubz., *C. curvans* Rubz. et Carlsson, *C. kuznezovi* Rubz., *C. verna* Rubz., *Eusimulium argentipile* Rubz., *E. Silvaticum* Rubz., Genus *Nevermannia angustitarsis* Lundstrom (*Eusimulium*

angustitarsis Lund.), *N. Lundstromi* Rubz., *Parabyssodon transiens* Rubzov (*Byssodon transiens* Rubz.), *Odagmia frigida* Rubz., *O. ornata* Mg., *O. Pratora* Fried., *O. rotundata* Rubz., *Prosimulium hirtipes* Fries. (*P. Hirtipes diminutum* Rubz.), *Schoenbaueria pusilla* Fries, *Simulium abbreviatum* Rubz., *S. aemulum* Rubz., *S. curvistylus* Rubz., *S. curvitarse* Rubz., *S. hibernale* Rubz., *S. morsitans*, *S. Posticatum* Rubz., *S. promorsitans* Rubz., *S. reptans* L., *S. rostratum* Lund., *S. simulans* Rubz., *S. venustum* Say, *Stegopterna majalis* Rubz. et Carlsson, and *Wilhelmia edulina* Linnaeus.

For the Moscow region, Vlasov [42] noted 29 species and 1 subspecies of midges belonging to 9 genera, of which 18 species and 1 subspecies for the first time. The midge fauna is represented by *Stegopterna duodecimata* Rubz., *S. trigoni* Lundström (*Stegopterna richteri* Enderlein), *Cnephia pallipes* End. (*Astega lapponica* End.), *Byssodon maculatus* Mg., *Parabyssodon transiens* Rubz., *Cnetha verna* Macq. (*Cnetha latipes* Mg.), *C. silvestris* Rubz., *Nevermannia angustitarsis* Lundstrom, *N. Latigonia* Rubz., *N. Volhynica* Ussova et Pavl., *Eusimulium aureum* Fries, *E. Angustipes* Edw. (*E. Latizonum* Rubz.), *Schoenbaueria nigra* Mg., *Wilhelmia eguina* Linnaeus, *Boophthora chelevini* Ivaschenko, *B. erythrocephala* D. G. (*B. mihalyii* Rubz., *B. sericata* Mg.), *Odagmia frigid* Rubz., *O. intermedia* Roubaud (*O. nitidifrons* Edw.), *O. Ornate* Mg., *O. pratorum* Fried., *O. rotundata* Rubz., *S. sp. aff. venustum* Say (*Simulium verecundum* St. Et Jamnb), *Simulium posticatum* Mg. (*Simulium austeni* Edw.), *S. Reptans* Linnaeus (*Simulium galeratum* Edwards), *Simuliumjanzeni* End., *S. longipalpe* Belt., *S. morsitans*, *Argentisimulium noelleri* Fried (*Simulium noelleri* Fried), *A. palustre* Rubz., and *Sim. truncatum* Lundstrom.

According to Budaeva and Ruchina [43] information about the fauna of midges in the article is given for the first time as a result of research in 2009-2013 in Mordovia, 11 species of midges belonging to 8 genera were registered: *Stegopterna trigoni* Lundstrom, *Wilhelmia balcanica* End., *W. eguina* Linnaeus, *Boreosimulium annulus* Lundstrom, *Byssodon maculatus* Mg., *Schoenbaueria nigra* Mg., *Boophthora erythrocephala* D. G., *Odagmia ornate* Mg., *O. pratora* Fried., *Argentisimulium noelleri* Fried., and *Sim. Paramorsitans* Rubz.

The fauna of biting midges of the central Non-Black-Soil Zone region is represented by 15 species from 10 genera: *Stegopterna trigoni* Lundström (*richteri* Enderlein), *Byssodon maculatus* Mg., *Eusimulium aureum* Fries, *Schoenbaueria nigra* Mg., *Sch. Dendrofila* Patrusheva, *Wilhelmia equina* Lannaeus, *Boophthora erythrocephala* D. G., *Odagmia ornata* Mg., *S. morsitans*, *Argentisimulium noelleri* Fried (*Simuliumnoelleri* Fried), *S. Paramorsitans* Rubz., *Sim. Sp. Aff. Venustum* Say (*Simulium verecundum* St. et Jamnb), *Cnetha verna* Macq. (*Cnetha latipes* Mg.), *C. silvestris* Rubz., *Nevermannia angustitarsis* Lundstrom (*Chelocnetha angustitarse* End.) [44].

The studies carried out by the authors Potapov A.A., Bogdanova E.N. and Vladimirova [45] in the Udora region of the Komi ASSR in the administrative district of the Komi Republic found 14 species belonging to 9 genera: *Boophthora erythrocephala* D. G., *Parabyssodon transiens* Rubzov (*Byssodon transiens* Rubz.), *Cnetha verna* Macquart (*Eusimulim latipes* Meigen), *Gnus rostratum* Lundstr., *Odagmia frigid* Rubz., *O.ornata* Mg., *Schoenbaueria sp.*, *Simulium rostratum* Lundstrom (*Simulium argyreatum* Meigen), *Sim. Reptans* Linnaeus (*Simulium galeratum* Edwards), *S. morsitans*, *S. Venustum* Say, *S. vulgare* Rubz., *Cnephia sp.*, *Wilhelmia equina* Lannaeus.

Bobrova [46], notes that studies of midges were carried out only in the southwestern part of Altai [47]. As a result of research on the fauna of midges in Altai, there are 33 species: *Gymnopais rubzovi* Bobr., *Helodon alpestris* Dorogostajsky, Rubzov et Vlasenko, (*Prosimulium alpestre* Dorogostajsky, Rubzov et Vlasenko), *Ahaimophaga alpestre* Dorogostajsky, Rubzov et Vlasenko (*Prosimulium alpestre altaicum* Rubz.), *Prosimulium macropyga* Lundstrom, *P.zaitzevi* Rubz. (*Prosimulium macropyga zaitzevi* Rubz.), *P. hirtipes* Fries. (*Prosimulium hirtipes deminutum* Rubz.), *P. tridentatum* Rubz., *P. arshanense* Rubz., *Cnephia pallipes* End. *Metacnephia edwardsiana* Rubz. (*Cnephia edwardsiana* Rubz.), *M.aff. kirjanovi* Rubz. (*Cnephiaaff. Kirjanovi* Rubz.), *M. Multifilis* Rubz. (*Cnephia multifilis* Rubz.), *M.aff. tetraginata* Rubz. (*Cnephiaaff. Tetraginata* Rubz.), *Sulcicnephia ovtshinnikovi* Rubz. (*Cnephia ovtshinnikovi* Rubz.), *S. tungus* Rubz. (*Cnephia tungus* Rubz.), *Montisimulium schevjakovi* Dorogostajsky, Rubzov et Vlasenko (*Eusimulium*

schevjakovi comosum Rubz.), *Cnetha verna* Macquart (*Eusimulim latipes* Meigen), *C. bicornis* Dorogostajsky, Rubzov et Vlasenko (*Eusimulimbicornis* Dorogostajsky et Rubzov), *C. curvans* Rubz. Et Carlsson (*Eusimulim Curvans* Rubz. Et Carlsson), *E. Aureum* Fries, *Gnus malyschevi* Dorogostajsky, Rubzov et Vlasenko, *G. decimarum* Dorogostajsky, Rubzov et Vlasenko, *G. Cholodkovskii* Rubz., *G. rostratum* Lundstr., *Odagmiaornata* Mg., *Tetisimulium bezzii* Corti, *T. alajense* Rubz., *T. latimentum* Rubz., *Archesimulium vulgare* Dorogostajsky, Rubzov et Vlasenko (*Simulium vulgare* Rubz.), *Argentisimulium palustre* Rubz. (*Simulium palustre* Rubz.), and *S. morsitans*.

In the southwestern Altai, in the maral breeding farms of OAO Aksu (Aksu, JSC) and TOO Yongu-Abzal (Yongu-Abzal, LLP), on maral pastures, they are located on meadow-steppe and forest-meadow belts of mountains, which are characterized by harsh conditions. The study of midges was carried out in 2004-2007. Isimbekov and Modiev [48] identified 7 species: *Archesimulium vulgare* Dorogostajsky, Rubzov et Vlasenko, *Argentisimulium noelleri* Fried, *Odagmia ornata* Mg., *Boophthora erythrocephala* D. G., *Cnetha verna* Macquart, *Sim. reptans* Linnaeus, and *Wilhelmia veltististshevi* Rubz.

According to the results of research by Petrozhitskaya [49, 50] and literature data, the midge fauna of Southern Altai currently includes 33 species of the genus *Simulium* from 7 subgenera.

For the basins of the Greater and Lesser Yenisei, which form the catchment area of the Upper Yenisei on the territory of Eastern Tuva, midges of 31 species from 5 genera were identified [51-53]. The variety of midges is represented by the following species: *Gymnopais andrei* Vorobets, *G. trifistulatus* Rubz., *Helodon alpestris* Dorogostajsky, Rubzov et Vlasenko, *H. irkutensis* Rubzov, *H. mesenevi* Patrusheva, *Prosimulium arshanense* Rubzov, *P. hirtipes* Frie, *P. tridentatum* Rubzov, *P. candicans* Rubzov, *P. intercalare* Rubzov, *P. kolymense* Patrusheva, *P. pecticrassum* Rubzov, *Metacnephia amshevi* Usova et Bazarova, *M. kirjanovae* Rubzov, *M. sommermannae* Stone, *Eusimulim longitarse* Rubzov et Violovich, *Nevermannia angustitarsis* Lundstrom., *N. longipes* Rubzov, *C. verna* Macquart, *Gnus cholodkovskii* Rubzov, *G. decimatatum* Dorogostajsky, Rubzov et Vlasenko,

G.jacuticum Rubzov, *G.malyschevi* Dorogostajsky, Rubzov et Vlasenko, *G.murmanum* End., *Odagmia ornate* Mg., *Sim. reptans* Linnaeus, *Archesimulium vulgare* Dorogostajsky, Rubzov et Vlasenko, *Simulium longipalpe* Belt., *Sim. rubzovi* Smart, and *Wilhelmia equinum* Linnaeus.

Research carried out by Dariychuk [54] on the territory of the Kachugsky district of the Irkutsk region in May - October 1965, marked the beginning of the study of midges in the upper Lena. In Lena, such malicious bloodsuckers hatched as *Sim. Reptans* Linnaeus (*Simulium galeratum* Edwards), *Prosimulium jacuticum* Rubz., and *S. morsitans* Edw., the following 12 species are also noted: *Eusimulim* species gr. *Latipes* Mg., *Eusimulim* species gr. *Aureum* Fries, *C. Bicornis* Dorogostajsky, Rubzov et Vlasenko (*Eusimulim bicornis* Dorogostajsky et Rubzov), *Odagmia ornate* Mg., *G. rostratum* Lundstr, *Archesimulium vulgare* Dorogostajsky, Rubzov et Vlasenko (*Simulium vulgare* Rubz.), *S. Rostratum* Lundstrom (*Simulium argyreatum* Meigen), *Argentisimulium noelleri* Fried (*Simulium noelleri* Fried), *Helodon alpestris* Dorogostajsky, Rubzov et Vlasenko, (*Prosimulium alpestre* Dorogostajsky, Rubzov et Vlasenko), *P. Candicans* Rubz., *Twinnia sedecimfistulata* Rubz., *Cnephia* sp. Gogolev V.B. [55] in the conditions of the Middle Volga region in the region of the Republic of Mari El revealed 11 species of biting midges of 5 genera: *Byssodon maculatus* Mg. (*Titanopteryx maculates* Meigen), *Yrenieradogieli* Ussova, *Cnetha verna* Macquart (*Eusimulim latipes* Meigen), *C. silvestris* Rubzov (*Eusimulium silvestris* Rubzov), *C. Bicornis* Dorogostajsky, Rubzov et Vlasenko (*Eusimulim bicornis* Dorogostajsky et Rubzov), *Eusimulium aureum* Fries, *Schonbaueria pusilla* Fries, *Odagmia ornata* Mg., *Simulium longipalpe* Belt., *S. rostratum* Lundstrom (*Simulium argyreatum* Meigen), and *Sim. reptans* Linnaeus (*Simulium galeratum* Edwards).

According to Budaeva and Silina (2013) the fauna and ecology of midges have not been previously studied in the Belgorod region. Carried out field works in 2007-2012 showed that 9 species of midges were found: *Wilhelmia balcanica* End., *W. lineate* Mg., *Cnetha verna* Macquart, *Nevermannia angustitarsis* Lundstrom., *N. latigonia* Rubz., *Eusimulium angustipes* Edw., *Boophthora erythrocephala* D. G., *Odagmia ornata* Mg., *Argentisimulium noelleri* Fried.

On the territory of the Caucasus region, the fauna was studied unevenly: the main part of the research was carried out at different times in the second half of the 20th century in Transcaucasia [56-58]. Rubtsov published information on the fauna of midges of the North Caucasus in short reports and general faunistic reports [3].

Currently, 22 species of midges belonging to 9 genera are found on the territory of Adygea: *Prosimulium petrosum* Rubz., *P. Pronevitshae* Rubz., *P.tomosvaryi* End., *Wilhelmia balcanica* End., *W. Pseudeguina* Seguy, *Cnetha angustata* Rubz., *C. djafarovi* Rubz., *C. elata* Rubz., *C. fontia* Rubz., *C. geigelenais* Djafarov, *Cnetha verna* Macquart, *Nevermannia gomphocornis* Rubz., *Eusimulium aureum* Fries, *Obuchoviaadornata* Rubz., *Paragnusbukovskii* Rubz., *Odagmiabaracornis* Smart, *O. caucasica* Rubz., *O. fantana* Terteryan, *O. Monticola* Fried., *O.monticoloides* Rubz., *O. ornata* Mg., and *Simulium tarnogradskii* Rubz.

Research carried out by Dementiev [59] showed that in the period 1985-2012 in fish farms and water bodies of the Central Ciscaucasia, starting from the Elbrus region to the water bodies of the Kuma-Manych depression and including the territories of the Stavropol Territory, Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Kalmykia, Ingushetia and Chechnya, 40 species of midges were noted: *Prosimulium gigas* Rubz., *P. Petrosum* Rubz., *P. rachiliense* Djafarov, *Boophthora erythrocephala* De Geer, *Byssodon maculatus* Mg., *Eusimulium angustipes* Edwards, *E. aureum* Rubzov, *E. maritimim* Rubzov, *E. sivaticum* Rubzov, *C. verna* Macquart, *Schoenbaueria nigra* Mg., *Montisimulium alizadei* Djafarov, *M. montium* Rubzov, *Wilhelmia angustifurca* Rubzov, *W. balcanicum* Enderlein, *W.dahestanicum* Rubzov, *W.eguina* Linnaeus, *W. lineatum* Mg., *Nevermannia angustitarsis* Lundstrom, *N. gomphocorne* Rubzov, *N. lundstromi* End., *Cnetha coctata* Friedrichs (*Nevermannia coctata* Friedrichs), *C.cryophilum* Rubzov, *C. elata* Rubzov, *C. fontia* Rubzov, *C. verna* Macquart, *Obuchovia adarnata* Rubzov, *Odagmia baracornis* Smart (*Simulium baracornis* Smart), *O. fontana* Terteryan (*Simulium fontana* Terteryan), *O. monticola* Friederichs (*Simulium monticola* Friederichs), *O. monticoloides* Rubzov, *O. variegata* Meigen, *O. ornata* Meigen, *O. schamili* Rubzov, *Tetisimulium bezzi* Corti, *Simulium longipalpe* Beltukova, *S. tarnogradskii* Rubzov, *S.*

morsitans Edwards, *S. paramorsitans* Rubzov, *S. shevtshenkovae* Rubzov, *S. simulans* Rubzov, and *Argentisimulium noelleri* Fried.

Alania National Park (NPA) is located on the northern slope of the Central Caucasus in the Uruk River basin; for the first time, information about its freshwater entomofauna is given by Khazeeva L.A. [60] — 2 species of midges were identified: *Odagmia ornata* Mg., *O. caucasicum* Rubz.

In the Voronezh region, among the most active hematophagous species, we should mention: *Byssodon maculatus* Mg., *Schoenbaueria nigra* Mg., *S. morsitans*, *S. paramorsitans* Rubz.

Midge observations on the Crimean Peninsula were carried out from 1969 to 2006. As a result of research by Panchenko [61] 32 species of midges were identified: *P. petrosum* Rubzov, *P. rufipes* Meigen, *C. verna* Macguart (*Cnetha latipes* Meigen), *C. brevidens* Rubzov, *C. chodakovi* Panchenko, *C. fontia* Rubzov, *C. gejjelense* Djafarov, *C. angustata* Rubzov, *C. tauricum* Rubzov, *C. karajimae* Panchenko, *W. angustifurca* Rubzov, *W. balcanica* Enderlein, *W. paraequina* Puri, *W. pseudeguina* Seguy, *W. veltistshevi* Rubzov, *N. lundstrami* Rubzov, *N. angustitarsis* Lundstrom (*Eusimulium angustitarsis* Lundstrom), *N. volhynica* Ussova et Pavlov, *E. aureum* Rubzov, *E. angustipes* Edwards (*Eusimulium latizonum* Rubzov), *E. velutinum* Santos Abreu, *E. krymense* Rubzov, *Obuchovia auricoma* Meigen, *O. brevifilis* Rubzov, *O. karasuae* Panchenko, *Paragnus bukovskii* Rubzov, *Odagmia pratora* Fried, *O. ornata* Meigen, *O. baracornis* Smart, *O. trifasciatum* Curtis, *Arg. Noelleri* Fried (*Simulium noelleri* Fried), *Sim. lugense* Yankovsky, and *Byssodon maculatus* Meigen (*Titanopteryx macularus* Meigen).

Research was carried out in areas remote from large rivers (Ob and Irtysh): in 1960 — in the Zonovo village, in 1962 — in Karasuk, in 1964 near Novosibirsk, also in the Maslyansky and Ordynsky districts of the Novosibirsk region, in 1964 near Novosibirsk. The Novosibirsk region is represented by the following types: *Cnetha meigeni* Rubzov et Carlsson (*Eusimulium pygmaeum* Ztterstedt sensy Rubzov), *Cnephia species*, *Byssodon maculatus* Meigen (*Titanopteryx macularus* Meigen), *S. pusilla* Fries., *Eusimulium aureum* Rubzov, *E. angustipes* Edwards, *E. silvaticum* Rubzov, *E. latipes* Meigen, *B. erythrocephala* De Geer, *S. morsitans* Edwards,

S. longipalpe Beltucivae, *S. rostratum* Lundström (*Simulium argyreatum* Meigen), *S. reptans* Linnaeus (*Simulium galeratum* Edwards), *S. aemulum* Rubzov, *Odagmia ornata* Meigen, *O. frigida* Rubzov, *Parabyssodon transiens* Rubzov (*Byssodon transiens* Rubz.), *A. noelleri* Fried (*Simulium noelleri* Fried), *Simulium vulgare* Rubzov.

Very little is known about the species composition of midges in the Tomsk region. In the studies of Popov [62] on the Tomsk region, 8 species of biting midges are given: *T. maculata* Mg., *C. verna* Macguart (*Cnetha latipes* Meigen), *E. aureum* Rubzov, *S. venustum* Say (*Simulium verecundum* St. et Jamnb), *S. reptans* Linnaeus, *S. Tuberosum* Lund, *S. morsitans* Edwards, and *S. pusilla* Fries. In the Aleksandrovsy district of the Tomsk region, Dariyчук [63] notes 7 species including 3 species are listed for the first time: *B. erythrocephala* De Geer, *C. verna* Macguart, *E. aureum* Rubzov. Patrusheva [7], notes the following species for the Tomsk region: *Byssodon maculatus* Meigen (*Titanopteryx macularus* Meigen), *S. morsitans*, *S. longipalpe* Beltucivae, *S. rostratum* Lundström (*Simulium argyreatum* Meigen), *S. Rangiferina* Rubzov, *N. Angustitarsis* Lundstrom (*Eusimulium angustitarsis* Lundstrom), *O. ornata* Meigen, *S. reptans* Linnaeus (*Simulium galeratum* Edwards).

In various areas of the basin of the Yana and Lena, according to the carried out research, Vorobets [43], 59 species of midges belonging to 18 genera were registered, of which 29 species are recorded for the first time in Yakutia: *Gymnopais trifistulatus* Rubzov, *Prosimulium candicans* Rubzov, *P. erythronotum* Rubzov, *P. hirtipes* Fries (*Prosimulium hirtipes diminutum* Rubzov), *P. macropyga* Lundstrom, *P. irkutense* Rubzov, *P. jacuticum* Rubzov, *Helodon rubicundus* Rubzov, *H. alpestris* Dorogostajsky, Rubzov et Vlasenko (*Prosimulium alpestri* Dorogostajsky, Rubzov et Vlasenko), *H. czekanowskii* Rubzov (*Prosimulium czekanowskii* Rubzov), *H. Rhizomorphus* Rubzov (*Prosimulium rhizomorphus* Rubzov), *Stegopterna asema* Rubzov, *S. majalis* Rubzov et Carlsson, *S. dentata* Rubzov et Carlsson, *S. decafilis* Rubzov, *Cnephia pallipes* Fries (*Cnephia pallipes* Enderlein), *Metacnephia saileri* Stone (*Metacnephia pallipes* Fries), *M. trigoniformis* Yankovsky (*Metacnephia trigonium* Lunstrom), and *M. taimyrica* Patrusheva,

Sulcinephthia tungus Rubzov, *Byssodon maculatus* Meigen (*Byssodon maculatus lenae* Rubzov), *Eusimulium aureum* Rubzov, *Cnetha chomustachi* Worobez (*Gomphostilbia chomustachi* Worobez), *Schoenbaueria rangiferina* Rubzov, *Sch. pusilla* Fries, *Sch. subpusilla* Rubzov, *Sch. brachyarthra* Rubzov, *Sch. gigantea* Rubzov (*Hemicnetha gigantea* Rubzov), *Cnetha verna* Macquart (*Cnetha latipes* Meigen), *C. silvesris* Rubzov, *C. bicornis* Dorogostajsky, Rubzov et Vlasenko, *C. pugetensis* Dyar et Shannon (*Eusimulium longipile* Rubzov), *C. curvans* Rubzov et Carlsson, *Hellichiella baffinensis* Twinn (*Cnetha baffinensis* Twinn), *Archesimulium tuberosum* Lunstrom (*Simulium tuberosum* Lunstrom), *Arch. vulgare* Dorogostajsky, Rubzov et Vlasenko (*Simulium vulgare* Rubzov), *Simulium venustum* Say, *Sim. truncatum* Lunstrom, *Sim. posticum* Meigen (*Simulium austeni* Edwards), *S. morsitans*, *Sim. paramorsitans* Rubzov, *Sim. longipalpe* Beltucovae, *S. aemulum*, *S. rubzovi*, *S. rostratum* (*S. argyreatum*), *S. venustum* (*S. verecundum*), *S. sp.*, *Boophthora erythrocephala*, *Gnus malyschevi* Rubzov, *G. jacuticum* Rubzov, *G. decimarum*, *G. cholodkovskii*, *G. pavlovskii*, *G. rostratum*, *G. subvariegatum*, *G. nakojapi*, and *Parabyssodon transiens*.

Aibulatov [44] analyzed literature, collected, and field data on fauna, and supplemented two species for the region: *Cnephthia angarensis* Rubzov and *Gymnopais frontatus* Yankovsky. Research conducted by Barashkova [45] of the basins of the Lena, Vilyui, and Kolyma rivers of the Republic of Sakha (Yakutia) notes 12 species. The diversity of the midge fauna on the territory of Kunashir, the southernmost of the islands of the Greater Kuril Ridge, is small — 3 species of midges of 3 genera were found here: *Cnetha spp.*, *Gomphostilbia makartshenkovi* Bodrova, *Odagmia nishijimai* Ono. [28].

CONCLUSION

To date, the topic is relevant and requires further research because these blood-sucking Diptera are carriers of several infectious and parasitic diseases in humans and animals.

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