ISSN 0013-8738, Entomological Review, 2014, Vol. 94, No. 9, pp. 1306–1312. © Pleiades Publishing, Inc., 2014.
Original Russian Text © M.V. Orlova, O.L. Orlov, A.V. Zhigalin, 2014, published in Parazitologiya, 2014, Vol. 48, No. 4, pp. 315–324.

New Records of Ectoparasites of the Eastern Water Bat *Myotis petax* Hollister, 1912 (Vespertilionidae, Chiroptera) and the Revision of the Material Previously Collected from *Myotis daubentonii* s. lato in the Eastern Palaearctic

M. V. Orlova[a], O. L. Orlov[b], and A. V. Zhigalin[a]

[a]*National Research Tomsk State University, pr. Lenina 36, Tomsk, 634050 Russia*
e-mail: masha_orlova@mail.ru
[b]*Institute of Animal and Plant Ecology, ul. 8 Marta 202, Yekaterinburg 620144, Russia*

Received February 6, 1914

Abstract—New records of ectoparasites from the eastern water bat *Myotis petax* Hollister, 1912, belonging to the Siberian-Russian Far Eastern complex and earlier regarded as the subspecies of the Daubenton's bat *Myotis daubentonii* s. lato, are given. Previous records of ectoparasites of the eastern water bat (old interpretation of the species) are revised. Fourteen species of bloodsucking arthropods feed on *M. petax*; these species include 4, 3, and 7 species of gamasid mites, fleas, and bat flies, respectively.

DOI: 10.1134/S0013873814090115

For many years, Daubenton's bat *Myotis daubentonii* (Kuhl, 1817) and the eastern water bat *M. petax* Hollister, 1912, owing to their significant morphological similarity, were treated as a single species. Thus, until the beginning of the 21st century the eastern water bat was described as the trans-Palaearctic species with the range extending from the Atlantic Ocean to the coast of the Pacific Ocean (Corbet, 1978; Bogdanowicz, 1994). Recently, however, craniometrical investigations (Kruskop, 2004) had demonstrated that *M. daubentonii* s. l. is a complex species. The genetic analysis of *M. daubentonii* s. l. allowed treating bats of this species distributed in the territory of Siberia (Buryatia, Altai, Tuva) and the Russian Far East (Primorskii Territory) as a separate species *Myotis petax* (Matveev et al., 2005).

The eastern water bat is widespread in the boreal zone of central and eastern Palaearctic, from the eastern part of Western Siberian Plain and western Altai to the coast of the Pacific Ocean (Matveev et al., 2005). Caves are the main shelters of this species in winter, whereas in summer it populates tree hollows and rock crevices. This species is characterized by high indices of infestation with ectoparasites belonging to different taxonomic groups (Orlova et al., 2013). Conferring the status of an independent species to the eastern water bat conditions the necessity to revise the existing concepts on host-parasite relations between arthropods and bats dwelling in the temperate zone of the eastern Palaearctic. Some examples of how the data on the distribution of highly specified ectoparasites allowed clarifying species confinedness of chiropterans testify to the urgency of this problem. For example, the species confinedness of bats collected in summer near Korliki Village (the eastern part of Khanty-Mansi Autonomous Area) was revised according to the findings of some bat flies (Nycteribiidae). Bats collected in this region were firstly identified as eastern water bats. However, the presence of the flies *Nycteribia quasiocellata* (Theodor, 1966) and *Basilia rybini* (Hůrka, 1969), specific ectoparasites of the Daubenton's bat *Myotis daubentonii*, allowed specifying the species confinedness of bats collected near Korliki Village. Preliminary conclusions based on the basis of ectoparasite records were later confirmed by detailed craniometrical studies of bats (Orlova et al., 2013).

The goal of the present work includes the analysis of the composition of the ectoparasite fauna of the eastern water bat. The results of this study may be used for specifying the range borders of this bat species.

MATERIALS AND METHODS

Our own material on bat ectoparasites was collected in 2007-2014. The data on collecting sites are given in the table and also in the figure.

Collecting sites and time (author's data)

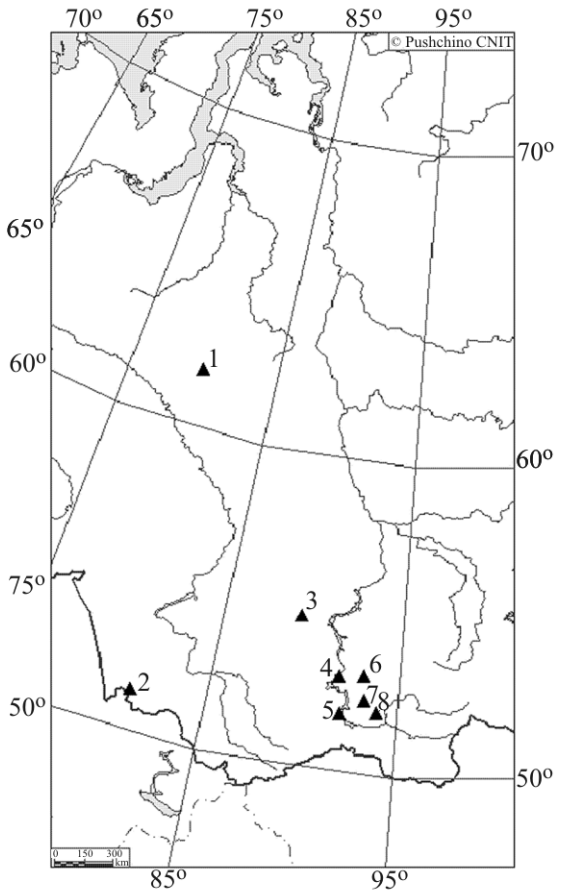
No.	Collecting site	Place of collecting	Coordinates of collecting site	Time of investigation
		Khanty-Mansi Autonomous Area		
1	Korliki Village	Buildings	61°31′N, 82°25′E	July 2007
		Altai Territory		
2	Tigirek Reserve: Cave Yashchur, caves in Mt. Semipeshchernaya	Caves	51°09′N 83°01′E	December 2012
		Republic of Khakassia		
3	"Kuznetsk Alatau" Reserve: the Kiya River	In hunting place above reservoir	54°56′N 88°21′E	August 2013
		Krasnoyarsk Territory		
4a	Shushenskoe Village	Buildings	53°20′N 91°56′E	September 2012
4b	The Sizaya River	In hunting place above reservoir	52°59′N 91°31′E	July 2013
5	Sayan-Shusha State Natural Reserve: the Khannyg River	In hunting place above reservoir	52°02′N 92°08′E	July 2012
6	The Oya River, near Bolshaya Rechka Village	In hunting place above reservoir	53°02′N 92°25′E	June 2012
7	"Ergaki" Natural Park, bank of the Talovka River	In hunting place above reservoir	52°21′N 93°10′E	August 2011
		Tyva Republic		
8	Uyuk Depression, the Sush River	Breeding colony under a bridge	52°03′N 94°03′N	July 2012

Ectoparasites were collected from chiropterans with the use of a needle and a pincer and fixed in a 70% ethanol solution. For preparation of constant slides, mites were embedded in Fora-Berlese solution. The fleas were treated with 10% KOH water solution to remove the soft tissues and also mounted in Fora-Berlese medium. The hippoboscid flies were fixed in ethanol solution. Ectoparasites were determined with the use of available keys (*Key to Insects of the Russian Far East*, 1999; Stanyukovich, 1997; Theodor, 1954; Theodor, 1967) under Nikon Eclipse 50i and MBS-10 optical microscopes. Schematic maps of collecting sites were made with the use of "Interactive Maps" electronic resource (Federal Portal "Russian Education").

A total of 428 specimens of fleas, louse flies, and gamasid mites were collected from 56 eastern water bat specimens. The mean intensity index (MI) was calculated as the mean number of ectoparasites per infested host (without taking into account non-infested bats). The prevalence (P) demonstrated the fraction of infested specimens (Beklemishev, 1870).

Species Composition of Ectoparasites of the Eastern Water Bat

Earlier it has been demonstrated that specific parasites of the eastern water bat are represented by hippoboscid flies *Nycteribia quasiocellata* and *Basilia rybini* (Orlova et al., 2013). Additional material on the ectoparasite fauna of the eastern water bat are given below. In particular, we had collected 2, 3, and 1 species of gamasid mites, louse flies, and fleas, respectively, from the eastern water bat in the territory of western and central Siberia (see figure). Among these species, the mites *Spinturnix myoti* (Kolenati, 1856) and *Macronyssus charusnurensis* Dusbabek, 1966, the flea *Myodopsylla trisellis* Jordan, 1929, and the louse fly *Penicillidia monoceros* (Speiser, 1900) were mentioned as ectoparasites of the eastern water bat for the first time.



Collecting sites of the eastern water bat in western and central Siberia: (1) Khanty-Mansi Autonomous Area, Korliki Vill.; (2) Altay Territory, Tigirek Reserve; (3) Republic of Khakassia, Kuznetsk Alatau Reserve (Kiya River); 4 — Krasnoyarsk Territory, Shushenskoe Vill., Sizaya Vill.; (5) Krasnoyarsk Territory, Sayan-Shusha State Biosphere Reserve; (6) Krasnoyarsk Territory, Bolshaya Rechka Vill., Oya River; (7) Krasnoyarsk Territory, "Ergaki" Nature Park (Talovka River); (8) Tyva Republic, Uyuk Depression (Sush River).

1. *Spinturnix myoti* (Kolenati, 1856). The species is distributed over the entire Palaearctic from Great Britain to the Russian Far East (Stanyukovich, 1997). *S. myoti* is the oligoxenic species recorded from different mouse-eared bat species.

Material. 60 specimens of *S. myoti* were collected from the eastern water bat in summer (July–August) and in winter (December). Collecting sites were situated in the territory of Khanty-Mansi Autonomous Area, Altai Territory, and Kusnetzk Alatau. In particular, 46 specimens (11♂, 11 ♀ (5 of which with larvae), 8 deutonymphs, and 16 protonymphs) were collected in Korliki Village (collecting site no. 1); 1 ♀, in the Tigirek Nature Reserve (no. 2); 13 specimens (10 ♂ and 3 ♀), near the Kiya River (no. 3).

The most complicated data was obtained by us during summer collecting near Korliki Village. In this site, on 18 specimens of the eastern water bat, MI and P of *S. myoti* constituted 3.3 and 78, respectively.

2. *Macronyssus charusnurensis* Dusbabek, 1966. Central-eastern-Palaearctic species (distributed from Cis-Urals to the Russian Far East) (Senotrusova and Tagiltsev, 1968; Medvedev et al., 1991; Orlova, 2014). Apparently, *M. charusnurensis* is the oligophagous species to some extent preferring the eastern water bat. The species was described from western Mongolia (the Khar-Us-Nuur Lake). *Myotis daubentonii* s. l. was mentioned as the host. Later, this mite species was reported from Japan also on *M. daubentonii* s. l. (Uchikawa, 1979). Together with *Myotis daubentonii* s. l., the whiskery bat *Myotis mystacinus* (Kuhl, 1817), the brown long-eared bat *Plecotus auritus* (Linnaeus, 1758)] (Stanyukovich, 1997), and also the Natterer's bat *Myotis nattereri* (Kuhl, 1817) (Orlova, 2014) were mentioned as hosts of the mite *Macronyssus charusnurensis*.

Material. A total of 118 specimens of *M. charusnurensis* were collected in 3 collecting sites in the territory of Khanty-Mansi Autonomous Area, Altai Territory, western Sayan, and Kusnetzk Alatau: 5 ♀ (all with eggs) were collected near Korliki Village (collecting site no. 1); 100 specimens (1 ♀ and 99 protonymphs), in the Tigirek Nature Reserve (no. 2); 1 ♀, near the Kiya River (no. 3); 8 specimens (3 ♀ with eggs and 5 protonymphs), in Sayan-Shusha Nature Reserve (no. 5); 4 specimens (protonymphs), near Bolshaya Rechka Village (no. 6).

The highest number of mites was collected from 5 specimens of the eastern water bat examined in winter in caves situated in the territory of the Tigirek Reserve. In this site, MI and P of *M. charusnurensis* constituted 33.3 and 60, respectively.

3. *Myodopsylla trisellis* Jordan, 1929. The range of this Palaearctic flea species covers the largest part of Russia from Leningrad Province to Primorskii Territory and Kamchatka. The species is associated with mouse-eared bats (Medvedev, 1985).

Material. A single specimen (female) was collected in western Sayan Mts. (collecting site no. 4a).

4. *Penicillidia monoceros* (Speiser, 1900). This is the trans-Palaearctic olygoxenic species of Hippoboscidae. The pond bat is the main host of *P. monoceros* in regions where the population density of the bat species is high. When the pond bat is absent or when its

population density is low, *P. monoceros* parasitizes the eastern water bat, Natterer's bat, and Daubenton's bat (Orlova, 2013). Some papers point to recordings of *P. monoceros* on *Myotis daubentonii s. l.* in the territory of eastern Kazakhstan (Polkanov and Medvedev, 1997), the Russian Far East (Medvedev et al., 1990), and Japan (Mogi, 1979).

Material. 35 specimens of *P. monoceros* were collected from the eastern water bat in 7 collecting sites. In particular, 4 specimens (2 ♀ and 2 ♂) were collected near Korliki Village (collecting site no. 1); 2 ♀, in Tigirek Reserve (collecting site no. 2); 3 ♀ near Shushenskoe Village (no. 4a); 10 specimens (2 ♂ and 8 ♀), in Sayan-Shusha State Natural Reserve (no. 5); 8 specimens (7 ♂ and 1 ♀), in Krasnoyarsk Territory (no. 6); 3 ♀, in Ergaki Natural Park (collecting site no. 7); 2 ♀, in Tuva (no. 8).

Thus, *P. monoceros* is a widespread louse fly species recorded in the examined territory in July, August, and December.

5. *Nycteribia quasiocellata* (Theodor, 1966). This is a central-eastern Palaearctic species of Nycteribiidae. Apparently, *M. charusnurensis* is an oligophagous species preferring the eastern water bat, because the majority of records were made from this species. The species was described from western Mongolia on *Myotis daubentonii* s. l. No records of the eastern water bat were ever made in this territory. As far as it is known at present, to the east of western Siberia the *daubentonii-petax* pair of cryptic species is represented only by *M. petax*, all the representatives of the Daubenton's bat recorded from Mongolia should be treated as recordings of the eastern water bat. The flies *Nycteribia quasiocellata* were also found on the whiskered bat *Myotis mystacinus* (Kuhl, 1817) in eastern Kazakhstan (Zaisan basin). The species identification of this bat was performed by A.A. Tagiltsev (Hůrka, 1969). The majority of the records of *N. quasiocellata* were, however, associated with *Myotis daubentonii* s. l. (Polkanov and Medvedev, 1997; Medvedev et al., 1990). Solitary specimens of *N. quasiocellata* were also collected from other mouse-eared bat species: *M. nattereri* (Kuhl, 1817) and *M. capaccinii* (Bonaparte, 1837)], and also from the Savi's pipistrelle *Hypsugo savii* (Bonaparte, 1837)] and the common bent-wing bat *Miniopterus schreibersi* (Kuhl, 1817).

Material. A total of 34 specimens of *Nycteribia quasiocellata* were collected. Among them, 18 specimens (6 ♂ and 12 ♀) were recorded from the Tigirek Reserve (collecting site no. 2); 2 specimens (male and female, from Kuznetsk Alatau (no. 3); 3 ♂ near Shushenskoe Village (no. 4a); 10 specimens (5 ♂ and 5 ♀), from Sayan-Shusha State Natural Biosphere Reserve (no. 5); 1 ♀, from Ergaki Natural Park (no. 7).

In the material collected in northern Altai (Tigirek Reserve), prevalence of *N. quasiocellata* reached 100%, and MI constituted 3.6.

6. *Basilia rybini* (Hůrka, 1969). This is a central-eastern Palaearctic species of Nycteribiidae.

B. rybini was described from eastern Kazakhstan from the specimens identified by A.A. Tagiltsev as the whiskered bat (Hůrka, 1969). Collections of *Basilia rybini* made by A.Yu. Polkanov in eastern Kazakhstan (Zaisan basin), however, demonstrated that *B. rybini* was associated with *M. daubentonii* s. l. Record of *B. rybini* on the whiskered bat, mentioned by A.A. Tagiltsev, is probably erroneous as the result of incorrect species identification (Polkanov and Medvedev, 1997).

Material. 82 specimens of *B. rybini* were collected in 7 collecting sites in July, August, and September, and also in December. 16 specimens (8 ♂ and 8 ♀f) were collected in Tigirek Reserve (collecting site no. 2); 13 specimens (7 ♂ and ♀ females), in Kuznetsk Alatau (no. 3); 13 specimens (4 ♂ and 9 ♀), near Shushenskoe Village (collecting site no. 4a); 4 specimens (1 ♂ and 4 ♀), near Sizaya Village (collecting site no. 4b); 17 specimens (3 ♂ and 14 ♀), in Sayan-Shusha State Natural Reserve (no. 5); 18 specimens (7 ♂ and 11 ♀), in Krasnoyarsk Territory (no. 6); 1 ♀, in Ergaki Natural Park (no. 7).

Other Probable Ectoparasites of the Eastern Water Bat

A list of probable ectoparasites of the eastern water bat is represented below.

Insecta: Diptera

Bat flies of the family Nycteribiidae

1. *Nycteribia pygmaea* (Kishida, 1932). This is an eastern Palaearctic species. It was recorded in Primorskii Territory on *Myotis daubentonii* s. l. and on the common bent-winged bat. The eastern water bat was mentioned as a host in Japan (Sato and Mogi, 2008), although at the time of appearance of the above com-

munication it had been demonstrated that the Daubenton's bat (and not the eastern water bat) was distributed in the territory of Japan (Kruskop, 2004; Matveev et al., 2005). Probably, *Nycteribia pygmaea* is a polyphagous species parasitizing on different species of vesper bats of the family Vespertilionidae.

2. *Nycteribia pleuralis* Maa, 1968. This is an eastern Palaearctic species. Similarly to the previous species, it has been reported from Japan (Sato and Mogi, 2008) from the bat identified as the eastern water bat. From South Korea, it was recorded from Natterer's bat (Kim et al., 2012). *N. pleuralis* is known by single findings and its host preferences remain unknown.

3. *Basilia mongolensis* Theodor, 1966. Similarly to *N. quasiocellata*, this species was described from western Mongolia as a parasite of *M. daubentonii* s. l. This is the central Palaearctic species, probably associated with chiropterans of exposed biotopes (first of all, with the steppe whiskered bat *Myotis aurascens* Kuzyakin, 1935) (Polkanov and Medvedev, 1997), own data). Originally, findings from eastern Kazakhstan were associated with the above whickered bats (Hůrka, 1969).

Acari: Mesostigmata

Mites of the cohort Gamasina

4. *Ichoronyssus mirabilis* Senotrusova et Tagiltsev, 1968, later treated as the junior synonym of *Macronyssus charusnurensis* Dusbabek, 1966 (Medvedev et al., 1991), was described from the abovementioned whiskered bats collected in eastern Kazakhstan (Zaisan basin) (Senotrusova and Tagiltsev, 1968).

5. *Macronyssus yesoensis* Uchikawa, 1979. This species has been recorded from the eastern water bat (in the old interpretation of the species) collected in Japan (Uchikawa, 1979) and North Korea (Kim and Kang, 1991). Probably, this is a polyphagous species parasitizing on vesper bats of the family Vespertilionidae, because at different times it has been collected from *Eptesicus nilssonii* (Keyserling and Blasius, 1839) and *Myotis gracilis* Ognev, 1927 (Uchikawa, 1979).

Thus, the eastern water bat can be designated as the main or one of the main hosts of the abovementioned ectoparasite species. According to the latest studies, it is the eastern water bat and not the Daubenton's bat that dwells in the above territories in the eastern Palaearctic (Matveev et al., 2005). Previously published data (Medvedev et al., 1990) concerning the species composition of ectoparasites of the Daubenton's bat in the Russian Far East, should also be revised. For example, the gamasid mite *Macronyssus granulosus* Kolenati, 1856, the louse fly *Basilia truncata* Theodor, 1966, and the fleas *Ischnopsyllus hexactenus* (Kol., 1856) and *I. comans* (J. et R., 1921) should also be designated as parasites of the eastern water bat.

Thus, it can be assumed that the abovementioned 3 species of gamasid mites, 6 bat fly species, and a single flea species are parasites of the eastern water bat in the territory of the central and eastern Palaearctic.

DISCUSSION

From our point of view, revision of recordings of ectoparasites found on the eastern water bat allows clarifying its range borders. Since the eastern water bat is associated with forested landscapes, earlier it was considered that its range was limited to the taiga and forest-steppe zones (Matveev et al., 2005). However, for example, records of the gamasid mite *Macronyssus charusnurensis* and the louse fly *Nycteribia quasiocellata* near the Lake Khar-Us-Nuur in western Mongolia (Dusbabek, 1966) may testify to the fact that the eastern water bat can also penetrate into the steppe zone along the floodland intrazonal biotopes (gallery forests).

It can be assumed that the eastern water bat is the host of 14 ectoparasite species, including 4, 3, and 7 species of gamasid mites, fleas, and bat flies, respectively. Among these species, specific ectoparasites of the eastern water bat include the mite *Macronyssus charusnurensis* and bat flies *Nycteribia quasiocellata* and *Basilia rybini*, possessing ranges coinciding with the range of the eastern water bat. The other abovementioned species are oligophagans parasitizing different species of mouse-eared bats. These species include the mite *Spinturnix myoti*, the flea *Myodopsylla trisellis*, and the bat fly *Penicillidia monoceros*. Some species (the bat fly *Nycteribia pygmaea* and the mite *Macronyssus yesoensis*) are polyphagous species parasitizing different species of vesper bats.

The annual dynamics of population density and sex and age structure of the mite *M. charusnurensis* is similar to that found in western Palaearctic species *M. corethroproctus*, *M. diversipilis*, and some others (Senotrusova and Tagiltsev, 1968; Orlova et al., 2012,

2014). The high MI (33.3) of *M. charusnurensis*, recorded at the beginning of wintering on the eastern water bat in Tigirek Reserve, is explained by the autumn increase of mite population density. This is also characteristic of other bat ectoparasites belonging to the genus *Macronyssus* (Orlova et al., 2012).

Earlier it has been demonstrated that during wintering, infrapopulation of mites belonging to some western Palaearctic species of the genus *Macronyssus* consists mainly of immature stages, constituting more than 90 % of the population (Orlova et al., 2012). New data on *M. charusnurensis* agree with this fact: 99 out of 100 specimens were represented by protonymphs. Age and sex structure of *M. charusnurensis* in summer was described by Senotrusova and Tagiltsev (1968). In particular, it was mentioned that, in the superpopulation of *M. charusnurensis,* females constituted more than half (54.7 %) of the total number of specimens. Dominating of females in summer (52 % of the total number), according to our data (Orlova et al., 2014), is also typical of such western Palaearctic mite species, as *M. corethroproctus*. This regularity is the most interesting, because *M. charusnurensis* belongs to the Siberian-Far Eastern complex of species that has developed independently of the European-Uralian complex where *M. corethroproctus* belongs (Orlova, 2014).

We observed high indices of infestation and abundance of the gamasid mite *Spinturnix myoti* (3.3 and 78, respectively) in summer in the material collected near Korliki Village (collecting site no. 1). These indices point to association between reproductive periods of species of the genus *Spinturnix* and of their host. This conclusion agrees both with earlier revealed biological peculiarities of the genus *Spinturnix* (Lučan, 2006) and with our data concerning the life cycle of *S. myoti* (Orlova et al. 2014). It should also be mentioned that records of the louse fly *Penicillidia monoceros* on the eastern water bat confirm our earlier assumption (Orlova et al., 2014) that this species can parasitize other bat species when the population density of its main host, the pond bat, is low.

ACKNOWLEDGMENTS

The authors are grateful to K.A. Bernikov (Surgut State University) for providing the collected material from the territory of Khanty-Mansi Autonomous Area.

The work was financially supported by the Laboratory of monitoring of biodiversity of the National Research Tomsk State University.

REFERENCES

1. Beklemishev, V.N., *The Biocenological Basis of Comparative Parasitology* (Nauka, Moscow, 1970) [in Russian].
2. Bogdanowicz, W., "*Myotis daubentonii*," Mammalian Species **475**, 1–9 (1994).
3. Corbet, G.B., *The Mammals of the Palaearctic Region: a Taxonomic Review* (British Museum (Natural History), London, 1978).
4. Dusbabek, F., "A Contribution to the Knowledge of Parasitic Mites from Mongolia (Acarina, Gamasides)," Mitt. Zool. Mus. Berlin **42**, 43–58 (1966).
5. Federal Portal "Russian Education," http://www.edu.ru/maps/ (December 19, 2013).
6. Hůrka, K., "*Basilia (Basilia) rybini* sp. n. and Notes on the Nycteribiidae of the Caucasus and Central Asia (Diptera, Pupipara)," Acta Entomol. Bohemoslovaca **66** (6), 387–398 (1969).
7. *Key to Insects of the Russian Far East*. *Vol. 6. Dipterans and Fleas*. Part 1 (Dal'nauka, Vladivostok, 1999) [in Russian].
8. Kim, H.C., Sang, H.H., Dick, C.W., Yong, G.C., Sung, T.C., Klein, T.A., and Rueda, L.M., "Geographical Distribution of Bat Flies (Diptera: Nycteribiidae and Streblidae), Including Two New Records, *Nycteribia allotopa* and *N. formosana*, Collected from Bats (Chiroptera: Rhinolophidae and Vespertilionidae) in the Republic of Korea," J. Vector Ecol. **37** (2), 333–337 (2012).
9. Kim, M.H. and Kang, B.C., "Investigations Mites Marasitic Mats Korea (Acari–Mesostigmata)," Korean Arachnol. **6** (2), 269–273 (1991).
10. Kruskop, S.V., "Subspecific Structure of *Myotis daubentonii* (Chiroptera, Vespertilionidae) and Composition of the "*daubentonii*" Species Group," Mammalia **68**, 299–306 (2004).
11. Lučan, R.K., "Relationships between the Parasitic Mite *Spinturnix andegavinus* (Acari: Spinturnicidae) and Its Bat Host, *Myotis daubentonii* (Chiroptera: Vespertilionidae): Seasonal, Sex- and Age-related Variation in Infestation and Possible Impact of the Parasite on the Host Condition and Roosting Behavior," Folia Parasitol. **53**, 147–152 (2006).
12. Matveev, V.A., Kruskop, S.V., and Kramerov, D.A., "Revalidation of *Myotis petax* Hollister, 1912, and Its New Status in Connection with *M. daubentonii* (Kuhl, 1817) (Vespertilionidae, Chiroptera)," Acta Chiropterol. **7** (1), 23–37 (2005).
13. Medvedev, S.G., "Revision of the Family Ischnopsyllidae (Siphonaptera)," Parazitologiya **19** (1), 14–26 (1985).
14. Medvedev, S.G., Stanyukovich, M.K., Tiunov, M.P., and Farafonova, G.V., "Ectoparasites of Bats of the Russian Far East," Parazitologiya **25** (1), 27–37 (1991).

15. Mogi, M., "Two Species of Batflies (Diptera, Nycteribiidae) New to Japan with Description of a New Subspecies," Trop. Med. **21** (3), 145–151 (1979).
16. Orlova M. B., Chistyakov, D.V., Orlov, O.L., Kryuger, F., and Kshnyasev, I.A., "The Fauna of Ectoparasites of the Pond Bat (*Myotis dasicneme* (Boie, 1825), Chiroptera, Vespertilionidae)," Vestnik Sankt-Peterburg. Gos. Univ. Ser. 3, **1**, 24–38 (2014).
17. Orlova, M.B., Orlov, O.L., Kruskop, S.V., and Bernikov, K.A., "The Possibility of the Diagnosis of Cryptic Chiropteran Species by Specific Ectoparasites," Izv. RAN, Ser. Biol. **1**, 108–110 (2013).
18. Orlova, M.B., Orlov, O.L., and Kshnyasev, I.A., "Population Density Dynamics of the Mite *Macronyssus corethroproctus* (Oudemans, 1902) During Wintering of the Host, the Pond Bat (*Myotis dasycneme* (Boie, 1825))," Ekologiya **4**, 303–307 (2012).
19. Orlova, M.V., "Invasion of Specific Ectoparasites of Siberian-Far Eastern Bat Species to the Urals," Rus. J. Biol. Invasions **5** (1), 29–31 (2014).
20. Polkanov, A.Yu and Medvedev, S.G., "Contribution to the Fauna of Nyctebiriids (Diptera: Nycteribiidae) of Middle Asia and Kazakhstan," Parazitologiya **31** (2), 116–124 (1997).
21. Sato, M. and Mogi, M., "First Descriptions of the Males of *Ornithomya candida* Maa and *Nycteribia pleuralis* Maa : Diptera: Hippoboscidae and Nycteribiidae," Med. Entomol. Zool. **59** (1), 19–23 (2008).
22. Senotrusova, V.N. and Tagiltsev, A.A., "A New Species of Gamasoid Mite *Ichoronyssus mirabilis* Senotrusova et Tagiltsev (Acariformes, Gamasoidea) from Whiskered Bats in the Zaisan Basin," Zool. Zh. **47** (1), 134–136 (1968).
23. Stanyukovich, M. K., "Keys to the Gamasid Mites (Acari: Parasitiformes, Mesostigmata, Macronyssoidea et Laelaptoidea) Parasitizing Bats (Mammalia, Chiroptera) from Russia and Adjacent Countries," Rudolstädter naturhistorische Schriften **7**, 13–46 (1997).
24. Theodor, O., "Nycteribiidae," in *Die Fliegen der palearktischen Region*. (E. Schweitzerbart'sche Verlagsbuchhandlung (Erwin Nägele), Stuttgart, 1954), pp. 1–44.
25. Theodor, O., *An Illustrated Catalogue of the Rothschild Collection of Nycteribiidae (Diptera) in the British Museum (Natural History) with Keys and Short Descriptions for the Identification of Subfamilies, Genera, Species, and Subspecies, with an Introduction by Miriam Rothschild* (Trust British National History Museum, 1967).
26. Uchikawa, K., "Bat Mites of the Genus *Macronyssus* Kolenati (Acari, Macronyssidae)," Ann. Zool. Jap. **52** (4), 246–256 (1979).