ISSN 0013-8738, Entomological Review, 2016, Vol. 96, No. 8, pp. 1108–1114. © Pleiades Publishing, Inc., 2016.
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Fleas (Siphonaptera) Associated with Mammals and Birds in the Ciscaucasia

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Received April 11, 2016

Abstract—The flea fauna of the Ciscaucasia comprises 76 species, 13 of which are associated with birds and the rest, with mammals. Rodent parasites are the most numerous; fleas associated with carnivores, bats, and insectivores are less abundant. Fleas parasitize different species of birds of the orders Passeriformes, Anseriformes, Falconiformes, and Strigiformes. Among 41 flea genera known from the Caucasus, species of the genera *Amalaraeus*, *Araeopsylla*, *Atyphloceras*, *Caenopsylla*, *Callopsylla*, *Doratopsylla*, *Paraneopsylla*, *Peromyscopsylla*, *Phaenopsylla*, *Tarsopsylla*, and *Wagnerina* are absent in the Ciscaucasia. Only two subendemic species were revealed in the region; 33 flea species are distributed over the entire Ciscaucasia, while the distribution of others is limited to landscapes of one or two natural zones.

DOI: 10.1134/S0013873816080157

Earlier, we have analyzed the species diversity and host associations of fleas in the Caucasus and determined the main ways of migration of individual flea groups into this territory (Medvedev and Kotti, 2011, 2012). The fleas of the Greater Caucasus were considered in a separate paper (Kotti, 2015). This communication reports the results of the many years of research of the flea fauna of another large part of the Caucasian Isthmus.

The Ciscaucasia is a large and physiographically heterogeneous territory which extends for 900 km latitudinally. The main orographic unit of the Western Ciscaucasia is the Azov-Kuban Lowland, that of the Central Ciscaucasia is the Stavropol Upland, that of the Eastern Ciscaucasia is the Terek-Kuma Lowland. Continentality of the climate increases from west to east. The steppes, now almost completely plowed, are limited to the Western and Central Ciscaucasia. Forest-steppes are common in the southwestern part of the Stavropol Upland, and semi-deserts predominate in the Eastern Ciscaucasia.

The mammal fauna of the Ciscaucasia comprises 84 species, and there are about 170 bird species nesting in this territory (Petrov et al., 1982). The forestless areas are inhabited by mammals and birds making nests on the ground or in burrows. Forest biotopes are inhabited by animals that make their shelters in tree hollows or among branches.

The studies of the Ciscaucasian fauna of fleas are of great importance for zoogeographic analysis because this territory lies at the junction of three zoogeographic regions. The study of fleas from the Ciscaucasia is also of great medical significance since it contains the Caspian sandy and the Dagestan lowland-foothill natural foci of plague, and there is also the Terek-Sunzha low-mountain natural focus adjoining it from the south (Onishchenko and Kutyrev, 2004).

The history of studies of fleas in the Ciscaucasia was covered in an earlier paper (Kotti and Kot, 2014). The first mention of fleas in this territory was made in the first half of the XIX century (Motschulsky, 1840). Data on the fleas of the Ciscaucasian rodents and insectivores started to accumulate at the beginning of the XX century, and in the second half of that century papers were published on the flea faunas of individual regions: Dagestan, Grozny Province, Kabardino-Balkaria, North Ossetia, Stavropol and Krasnodar Territories. Data on the hosts, landscape-biotopic associations, and other biological features of fleas in the Ciscaucasia were summarized in the *Key to the Fleas of the Caucasus* (Tiflov et al., 1977).

Recent publications contain data on the zoogeography of fleas in the Central Ciscaucasia, their host relations, and interesting findings of certain species. Brief data on ranges and hosts of fleas of the Caucasus as a whole are presented in my monograph (Kotti, 2014).

MATERIALS AND METHODS

This work is based on the material collected by me in the period between 1978 and 2015 in 25 localities within different parts of the Central and Eastern Ciscaucasia. Altogether, about 80 thousand fleas collected from 12 thousand mammals and found in 207 mammal and bird nests were identified to species.

In addition, I studied the flea collections from the Western, Central, and Eastern Ciscaucasia made by N.N. Bakeev, N.F. Darskaya, V.G. Grachev, A.R. Ismailova, T.I. Kazakova, L.A. Kot, N.I. Kudryashova, N.F. Labunets, G.P. Lukina, K.I. Mishurina, L.F. Orlova, A.F. Pilipenko, P.A. Reznik, M.N. Sizonenko, O.I. Skalon, E.N. Tregubova, K.Yu. Shkarlet, and R.V. Zuev.

Some data on the flea fauna of the Ciscaucasia were obtained by studying the collections and archives of Stavropol Antiplague Research Institute, the Zoological Institute of RAS (ZIN), and Dagestan and Black Sea antiplague stations.

According to the specificity of host choice, fleas can be classified into monoxenous or ultraspecific parasites, which parasitize hosts of one species only, and oligoxenous parasites infesting several species from one host genus. Besides, among fleas there are pleioxenous parasites which have the main hosts from several genera of one family, and also polyxenous parasites whose hosts may belong to different families, orders, and even classes (Balashov, 2009).

The names of birds are given according to Stepanyan (2003), those of mammals, according to Pavlinov and Lisovsky (2012). Data on bird and mammal faunas of the Ciscaucasia are based on a number of publications (Isakov et al., 1966; Tembotov, 1972; Tembotov and Kazakov, 1982; Sokolov and Tembotov, 1989; Tarasov, 2002).

The ranges of flea species are classified using the nomenclature originally suggested by Kryzhanovsky (2002) for free-living insects and previously used for fleas (Kotti, 2005, 2013). The flea species are united into groups and complexes according to the size, outlines, continuity, and geographic position of their ranges; the landscape associations of these species are also indicated (table).

Specificity of Host Associations of Fleas

The Ciscaucasia occupies one-third of the territory of the Caucasus. Its flea fauna counts 76 species, or about 50% of the total number of species known in the Caucasus.

The mammal fauna of the Ciscaucasia comprises 84 species, which is more than a half of the total number of species known in the Caucasus (130 species).

Only 50 species of the orders Insectivora, Chiroptera, Carnivora, and Rodentia are known in the Ciscaucasia as flea hosts. The insectivores are not evenly distributed. They are represented by moles (genus *Talpa*), shrews (family Soricidae), and hedgehogs (family Erinaceidae).

Among bats the most common are the greater horseshoe bat *Rhinolophus ferrumequinum* Schreber, the common noctule *Nyctalus noctula* (Schreber), the lesser mouse-eared bat *Myotis blythii* (Tomes), and the parti-colored bat *Vespertilio murinus* L. Of the carnivores, the wolf *Canis lupus* L., the common jackal *C. aureus* L., the red fox *Vulpes vulpes* (L.), and the European badger *Meles meles* (L.) are widespread in the Ciscaucasia; the corsac fox *V. corsac* (L.), the steppe polecat *Mustela eversmanni* Lesson, and the marbled polecat *Vormela peregusna* (Güldenstädt) are common in the steppe and semi-desert landscapes.

Of rodents, the common and abundant inhabitants of semi-deserts are the tamarisk jird *Meriones tamariscinus* Pallas, 1773, the midday jird *M. meridianus* Pallas, 1773, the house mouse *Mus musculus* L., five-toed jerboas of the family Allactagidae, the steppe field mouse *Sylvaemus fulvipectus* Ognev, the social vole *Microtus socialis* (Pallas), the Russian mole rat *Spalax giganteus* Nehring, and the northern mole vole *Ellobius talpinus* Pallas. All these species are characteristic of the Eastern Ciscaucasia and are practically absent in the Greater Caucasus. The rodent population in the steppes mainly consists of the steppe field mouse, the pygmy wood mouse *Sylvaemus uralensis* (Pallas), the house mouse, and the common vole *Microtus arvalis* (Pallas). The range of the little ground squirrel *Spermophilus pygmaeus* (Pallas) is broken up into small insular plots lying mainly in the semi-desert and desert landscapes. A different species of ground squirrel occurs in the Greater Caucasus.

As a rule, each flea species parasitizes hosts from one order of mammals. There are only single exceptions; for example, the fleas *Hystrichopsylla talpae* Curtis, 1826 and *H. satunini* Wagner, 1916 are parasites of both insectivores (Talpidae) and rodents (Cricetidae).

Distribution of flea species over landscapes in the Ciscaucasia

Ranges of fleas	Landscapes and flea species
	Forest-steppe, steppe, and semi-desert landscapes
Cosmopolitan	*Xenopsylla cheopis*, *Ctenocephalides felis*, *C. canis*, *Nosopsyllus mokrzeckyi*, *N. fasciatus*, *Leptopsylla segnis*
Multiregional	*Pulex irritans*, *Dasypsyllus gallinulae*, *Rhinolophopsylla unipectinata*
Holarctic	*Chaetopsylla globiceps*, *Ceratophyllus borealis*, *C. garei*
Trans-Palaearctic	*Ceratophyllus farreni*
Trans-Eurasian	*Ceratophyllus styx*, *C. fringillae*, *C. tribulis*, *C. pullatus*, *Ischnopsyllus elongatus*
Western Palaearctic	*Archaeopsylla erinacei*, *Ischnopsyllus intermedius*, *I. octactenus*
Western–Central Palaearctic	*Ceratophyllus hirundinis*
Euro-Siberian	*Ceratophyllus spinosus*, *C. gallinae*, *Amphipsylla rossica*
European–Central Asian	*Chaetopsylla rothschildi*, *Nosopsyllus consimilis*, *Nycteridopsylla dictena*
European	*Ischnopsyllus variabilis*, *Nycteridopsylla eusarca*
Caucasian–Central Asian	*Ceratophyllus igii*
Eucaucasian	*Ischnopsyllus dolosus*
	Forest-steppe landscapes
Trans-Eurasian	*Ceratophyllus sciurorum*
Euro-Siberian	*Chaetopsylla trichosa*, *Megabothris turbidus*
European–Central Asian	*Myoxopsylla jordani*
Western–Central Palaearctic	*Hystrichopsylla talpae*
Eucaucasian	*Rhadinopsylla caucasica*, *Hystrichopsylla satunini*
	Forest-steppe and steppe landscapes
European–Central Asian	*Mesopsylla hebes*, *Leptopsylla taschenbergi*, *Ctenophthalmus golovi*, *C. secundus*, *C. wagneri*
European–West-Asian	*Paraceras melis*
Euro-Caucasian	*Ctenophthalmus spalacis*, *C. proximus*
Eucaucasian	*Palaeopsylla gromovi*, *P. alpestris*, *P. osetica*
	Steppe and semi-desert landscapes
Holarctic	*Oropsylla idahoensis*
Mediterranean	*Echidnophaga gallinacea*
European–Central Asian	*Citellophilus tesquorum*, *Ophthalmopsylla volgensis*, *Frontopsylla semura*, *Ctenophthalmus secundus*, *Neopsylla setosa*, *Rhadinopsylla ucrainica*, *Stenoponia ivanovi*
Euro-Caucasian	*Ctenophthalmus orientalis*
Ciscaucasian–Central Asian	*C. acuminatus*
Caucasian–Central Asian	*Mesopsylla tuschkan*
	Semi-desert landscapes
Mediterranean	*Leptopsylla algira*, *Xenopsylla conformis*
European–Central Asian	*Xenopsylla magdalinae*, *Frontopsylla frontalis*
Caucasian–Central Asian	*Echidnophaga popovi*, *Coptopsylla bairamaliensis*, *Nosopsyllus laeviceps*, *Frontopsylla macrophthalma*, *Amphipsylla schelkovnikovi*, *Stenoponia vlasovi*
Caucasian	*Paradoxopsyllus gussevi*
Ciscaucasian	*Ctenophthalmus gigantospalacis*, *Rhadinopsylla acuminata*

The Fleas of Insectivores

Of the 10 species of insectivores in the Ciscaucasian fauna, 7 species serve as hosts for 6 species of fleas. No fleas have been found on such rare insectivores as the Levant mole *Talpa levantis* Thomas, the bicolored shrew *Crocidura leucodon* (Hermann), and the Etruscan shrew *Suncus etruscus* (Savi).

The Caucasian mole *Talpa caucasica* Satunin is common in the forests of the Western and Central Ciscaucasia. It is parasitized by the flea *Palaeopsylla alpestris* Argyropulo, 1946 which is subendemic to the Caucasus. Moles are regarded as the main hosts of the Caucasian endemic *P. osetica* Ioff, 1953. Members of the subfamily Soricinae, namely the Caucasian pygmy shrew *Sorex volnuchini* Ognev, the Caucasian shrew *S. satunini* Ognev, and the Transcaucasian water shrew *Neomys teres* Miller are common in forest biotopes within the forest-steppe zone. Their parasite is another species of the genus *Palaeopsylla* subendemic to the Caucasus, namely *P. gromovi* Argyropulo, 1934. The flea *Leptopsylla algira* Jordan et Rothschild, 1911, infesting white-toothed shrews of the genus *Crocidura* Wagler, was recorded only in the eastern part of the region.

The northern white-breasted hedgehog *Erinaceus roumanicus* Barrett-Hamilton occurs ubiquitously in tree and shrub biotopes; it is parasitized by *Archaeopsylla erinacei* (Bouche, 1835). This flea species has a broad Western-Palaearctic range within which it infests not only *E. roumanicus* but also other hedgehogs of the genus *Erinaceus*. The eared hedgehog *Hemiechinus auritus* (Gmelin), parasitized by *Echidnophaga gallinacea* (Westwood, 1875), occurs in the Eastern Ciscaucasia.

Thus, the flea fauna of insectivores is represented in the Ciscaucasia by either Eucaucasian (distributed in the greater part of the Caucasus) species of the Trans-Palaearctic genus *Palaeopsylla* Wagner, 1903, or by species possessing southerner, Mediterranean or Western-Palaearctic ranges.

The Fleas of Bats

Only fairly incomplete data are available on the host associations of fleas of the family Ischnopsyllidae, which are specific ectoparasites of bats. Of the 14 species of bats present in the Ciscaucasia, 9 are known as hosts of 9 species of fleas.

Of the horseshoe bat family, the greater horseshoe bat distributed in the south part of the Ciscaucasia is the main host of *Rhinolophopsylla unipectinata* (Taschenberg, 1880).

The remaining Ciscaucasian bats belong to the vesper bat family. Of the subfamily Myotinae, the lesser mouse-eared bat is ubiquitous in the Ciscaucasia while the whiskered bat *M. mystacinus* (Kuhl) is absent in semi-desert landscapes. Both species are hosts of the flea *Ischnopsyllus dolosus* Dampf, 1912.

Of the subfamily Vespertilioninae, the common noctule is ubiquitous while the giant noctule *N. lasiopterus* (Schreber) is absent in the semi-desert zone; these two noctules are hosts of *I. elongatus* (Curtis, 1832). The parti-colored bat, parasitized by *Nycteridopsylla dictena* (Kolenati, 1856), *I. obscurus* (Wagner, 1898), and *I. intermedius* (Rothschild, 1898), occurs over the whole Ciscaucasia. The latter flea species has one more host, the serotine bat which is present in the forest-steppe and steppe zones but absent in semi-desert landscapes. The common pipistrelle *Pipistrelus pipistrelus* (Schreber) parasitized by the fleas *N. eusarca* Dampf, 1908 and *I. octactenus* (Kolenati, 1856), and also the Nathusius' pipistrelle *P. nathusii* (Keiserling et Blasius) with its parasite *I. variabilis* (Wagner, 1898) inhabit only the forest-steppe and steppe zones.

The bat fleas recorded in the Ciscaucasia mostly have vast ranges, except for *I. dolosus* that is subendemic to the Caucasus.

The Fleas of Carnivores

In the Ciscaucasia, 12 species of carnivores are the main hosts of 8 flea species. *Pulex irritans* L., 1758 parasitizes many carnivores of the families Canidae (wolf, common jackal, domestic dog, red fox, and corsac) and Mustelidae (European badger, steppe polecat, and marbled polecat). The parasites of the wolf, the red fox, and the European badger are three species of fleas: *Chaetopsylla globiceps* (Taschenberg, 1880), also known from the jackal, *Ch. trichosa* Kohaut, 1903, and *Echidnophaga popovi* Ioff et Argyropulo, 1934. The specific parasite of the European badger is the flea *Paraceras melis* (Walker, 1856). The flea *Chaetopsylla rothschildi* Kohaut, 1903 was found on martens (genus *Martes*).

Ctenocephalides felis (Bouche, 1835) was mainly recorded in the Ciscaucasia on the domestic cat *Felis catus* L.; another species of this genus, *C. canis* (Curtis, 1826), was found on the domestic dog *Canis familiaris*.

Most parasites of carnivores are associated with several host species possessing vast overlapping ranges and are thus widely distributed over the whole Ciscaucasia. The exception is *E. popovi* recorded only in the eastern part of the Ciscaucasia at the western boundary of its Caucasian–Central Asian range.

The Fleas of Rodents

In the Ciscaucasia, 20 species of rodents serve as hosts for 40 species of fleas, which is more than a half of the total number of species associated with mammals in the local fauna. Some of these fleas use a wide range of hosts that includes representatives of different families inhabiting the same biotopes. For instance, in the steppe landscapes the fleas *Ctenophthalmus orientalis* (Wagner, 1898) and *C. golovi* Ioff et Tiflov, 1930 occur both on voles (family Cricetidae, subfamily Arvicolinae) and on the little ground squirrel (family Sciuridae).

Besides, the little ground squirrel is parasitized by such fleas as *Oropsylla idahoensis* (Baker, 1904), *Citellophilus tesquorum* (Wagner, 1898), *Frontopsylla semura* Wagner et Ioff, 1926, and *Neopsylla setosa* (Wagner, 1898).

Of the fleas found on the forest dormouse (family Gliridae), the specific parasites *Myoxopsylla jordani* Ioff et Argyropulo, 1934 and *Ceratophyllus sciurorum* (Schrank, 1803) should be noted.

Of the five-toed jerboas, the great jerboa *Allactaga major* (Kerr) and the small jerboa *Allactaga elater* (Lichtenstein) are the main hosts of the fleas *Ophthalmopsylla volgensis* (Wagner et Ioff, 1926), *Mesopsylla hebes* Jordan et Rothschild, 1911, *M. tuschkan* Wagner et Ioff, 1926, and *Frontopsylla macrophthalma* Jordan et Rothschild, 1915, mainly in the Eastern Ciscaucasia.

Various cricetid species have been recorded as hosts for many flea species. Some representatives of the subfamilies Cricetinae and Arvicolinae are hosts of *Nosopsyllus consimilis* (Wagner, 1898) over the whole Ciscaucasia and of *Ctenophthalmus wagneri* Tiflov, 1928 in the forest-steppe and steppe landscapes.

Examples of ultraspecific flea species may be found among parasites of cricetid rodents. The flea *Amphipsylla schelkovnikovi* Wagner, 1909 parasitizes the gray dwarf hamster *Cricetulus migratorius*, the common inhabitant of steppe and piedmont landscapes, only in the eastern part of the Ciscaucasia, and *C. acuminatus* Ioff et Argyropulo, 1954 occurs on the Ciscaucasian hamster *Mesocricetus raddei* over the whole region.

The voles are hosts of different flea species. For instance, the main hosts of *Stenoponia ivanovi* in the Ciscaucasia are the Major's pine vole *Terricola majori* Thomas and the common vole. Correspondingly, this flea is distributed only in the steppe and forest-steppe zones. The social and common voles are hosts of *Rhadinopsylla ucrainica* Wagner et Argyropulo, 1934. The social vole is the specific host of *C. secundus* Wagner, 1916 and *R. acuminata* Ioff et Tiflov, 1946 in the Ciscaucasia.

The common vole in the Ciscaucasia is the main host of 10 species of fleas, none of which is a monoxenous parasite. The only flea that occurs ubiquitously on this rodent is *N. consimilis*. The ultraspecific parasite *Xenopsylla magdalinae* Ioff, 1935 occurs on the northern mole vole in the northeast of the Ciscaucasia.

Two species of the family Spalacidae have ultraspecific fleas: *Ctenophthalmus spalacis* Ioff, 1935 on the greater mole rat, and *C. gigantospalacis* Ioff, 1929 on the Russian mole rat.

The fauna of the Ciscaucasia includes 6 species of the family Muridae, on which 9 flea species have been recorded. Of these, *Ctenophthalmus proximus* (Wagner, 1903) occurs on representatives of the genus *Sylvaemus* Ognev; *N. mokrzeckyi* (Wagner, 1916) also occurs on the house mouse, and *Leptopsylla taschenbergi* (Wagner, 1898), on the striped field mouse *Apodemus agrarius* (Pallas). The house mouse also serves as host for the monoxenous parasite *Leptopsylla segnis* (Schöncherr, 1811). The flea fauna of the Norway rat in the Ciscaucasia is represented by two species: *N. fasciatus* (Bosc, 1800) and *X. cheopis* (Rothschild, 1903).

The specific fleas *N. laeviceps* Wagner, 1909, *Stenoponia vlasovi* Ioff et Tiflov, 1934, and *Coptopsylla bairamaliensis* Wagner, 1929 occur on the midday and tamarisk jirds in the Eastern Ciscaucasia. The distribution of *X. conformis* (Wagner, 1903) is restricted to the far northeast of the Ciscaucasia.

Thus, of 63 species of fleas associated with mammals in the Ciscaucasia, about a half (32 species) are monoxenous parasites. There are considerably fewer flea species which are oligoxenous (16) and pleioxenous (8) parasites. Finally, only 7 flea species occur on representatives of different families or orders of mammals.

The Fleas of Birds

Over 300 bird species are known in the Ciscaucasia, of which about 170 species nest there. The species abundant in the semi-desert and steppe zones are larks (family Alaudidae) and sparrows (genus *Passer* Brisson). The common inhabitants of forests are the great tit *Parus major* L., the chaffinch *Fringilla coelebs* L., the blackbird *Turdus merula* L., and the chiffchaff *Phylloscopus collybita* (Vieillot). Of the swallow family, the house martin *Delichon urbica* (L.) is the common inhabitant of cities while the sand martin *Riparia riparia* (L.) is abundant along the steeps of ravines, river banks, and sand quarries.

Fleas of 13 species from 3 genera parasitize various bird species from the orders Passeriformes, Anseriformes, Falconiformes, and Strigiformes.

Some flea species are associated with birds of different orders inhabiting similar biotopes. For instance, *Ceratophyllus spinosus* Wagner, 1903 parasitizes such birds as the lesser kestrel *Falco naumanni* Fleischer and the little owl *Athene noctua* (Scopoli), which make their nests in human constructions.

Passerines make up the great majority of species in the Ciscaucasian bird fauna; 12 of them are parasitized by 11 species of fleas, of which 3 inhabit well-protected perennial nests of martins (family Hirundinidae). Only the flea *C. styx* Rothschild, 1900 is a monoxenous parasite of the sand martin. The fleas *C. farreni* Rothschild, 1905 and *C. hirundinis* (Curtis, 1826) parasitize the house martin which builds molded nests.

Fleas have been found on birds belonging to the following passerine families: Alaudidae, Sturnidae, Troglogloditidae, Sylviidae, Muscicapidae, Paridae, Sitidae, Passeridae, and Emberizidae. However, preference of certain flea species for hosts from only one of the above families has not been recorded. The reason for this is the fact that the variously designed nests of these birds are used only once. For instance, birds which are hosts of the flea *Dasypsyllus gallinulae* (Dale, 1878) build quite different nests confined to humid biotopes. The hosts of the fleas *Ceratophyllus gallinae* (Schrank, 1803) and *C. pullatus* Jordan et Rothschild, 1920 build nests in hollows and other protected places. These are, for instance, the great tit and the coal tit. The fleas *C. tribulis* and *C. fringillae* are associated with such forest birds as the chiffchaff, blackbird, chaffinch, and wren which build above-ground nests with walls made of grass. They also parasitize birds nesting in burrows and human constructions and those making nests of twigs. The field and house sparrows and also the starling should be also noted as their hosts. The isabelline wheatear, which serves as host for *Frontopsylla frontalis* Rothschild, 1909, also nests in burrows.

One more group comprises the fleas which occur on ground-nesting birds, such as larks; these are *C. garei* Rothschild, 1902 and *C. borealis* Rothschild, 1907.

Of anseriform birds, the hosts of *C. igii* Darskaya et Shiranovich, 1971 are species nesting in burrows, probably the ruddy and the common shelducks.

Thus, of 13 species of bird fleas only 4 are monoxenous parasites; 1 species is oligoxenous, and 8 are polyxenous. The position of the nest and the duration of its use by the host are important factors affecting the associations of fleas with birds (Darskaya, 1964; Jurik, 1974). The factors determining the temperature and humidity inside the nest are also important for such nidicolous parasites as fleas.

CONCLUSIONS

The fauna of fleas in the Ciscaucasia is relatively poor as compared with their diversity in other Caucasian regions. Of the 41 flea genera known from the territory of the Caucasian isthmus, 11 genera are not represented in the Ciscaucasia. Among them, there are genera including typical mountain species (*Paraneopsylla* Tiflov, 1937, *Amalaraeus* Ioff, 1936, and *Callopsylla* Wagner, 1934), and also those mainly distributed in the Turano-Iranian Province (*Phaenopsylla* Jordan, 1944, *Wagnerina* Ioff et Argyropulo, 1934) and southerner regions (*Araeopsylla* Jordan et Rothschild, 1906).

By the number of the flea species found (76), the Ciscaucasia yields markedly to the Greater Caucasus where 116 species are known to occur. There are only two subendemic flea species in the Ciscaucasia: *C. gigantospalacis*, the parasite of the Russian mole rat, and *Rhadinopsylla acuminata*, the parasite of the social vole.

Most of the flea species are distributed in all the nature zones of the Ciscaucasia, while those confined to forest-steppe, forest-steppe and steppe, steppe and semi-desert, or only semi-desert landscapes are less numerous.

The recent ranges of the Ciscaucasian fauna belong to 19 types or geographic groups. Species of the Ancient Mediterranean complex make up the core of the fauna, with the prevalence of European–Central Asian species. The boreal complex is dominated by Trans-Eurasian species. The Caucasian complex, which includes the Caucasian endemics and subendemics, is dominated by species with the Eucaucasian range type.

Most of the mammal flea species in the Ciscaucasian fauna are associated with rodents while the fleas occurring on carnivores, bats, and insectivores are several times as few. The common species of parasites of jirds, ground squirrels, hamsters, voles, and mole rats in the Ciscaucasia belong to the genera *Ctenophthalmus* Kolenati, 1856, *Citellophilus* Wagner, 1934, *Neopsylla* Wagner, 1903, and *Nosopsyllus* Jordan, 1933.

ACKNOWLEDGMENTS

This work was financially supported by the Russian Foundation for Basic Research (grants 11-04-00917-a and 14-04-01139).

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