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Taxonomic Species Composition of Orthoptera Insects (Insecta: Orthoptera) in Mountain and Sub-Mountain Regions of Surkhandarya Region and Their Distribution in Agrocenoses

Khalillayev Sherzod A.[1], Abdullaev Ikram I.[2], Kholmatov Bakhtiyor R.[3], Mirzaeva Gulnara S.[3]

[1]National University of Uzbekistan, Tashkent, Uzbekistan
[2]Khorezm Academy of Mamun, Khiva, Uzbekistan
[3]Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan

Abstract This article presents information on the species composition of insects and their bioecological features in the mountainous and foothill areas of the Surkhandarya region, located in the south of Uzbekistan. During the research in the Surkhandarya region, 54 species belonging to 38 genera of Orthoptera were identified. In natural landscapes, including mountainous and foothill areas, 28 species were found, 24 in cotton fields, 24 in corn fields, 19 in gardens, 18 in legume fields, and 12 in wheat fields. Three species are common in agrocenoses: *Dociostaurus maroccanus*, *Calliptamus italicus italicus* and *Locusta migratoria migatoria*, so it is very important to regularly monitor their numbers. Information on the diversity and number of Orthoptera species in different agrocenoses is at the highest level in June-August and on some of their bioecological features.

Keywords Orthoptera insects, Family, Genus, Species, Larva, Imago, Natural landscapes, Agrocenosis

1. Introduction

Orthopterans are widespread in almost all climatic regions, from tropical and subtropical regions to the vastness of Western Siberia. Some species prefer to live near water bodies in mountainous areas with dense grass. Other species have always attracted researchers as components of rare shrubs and herbs in desert and semi desert regions [6]. Orthopterous insects have always been attractive to researchers as a component of different Central Asian landscapes [1,4,6,8]. Orthoptera in the agrocenoses of the southern part of the Aral Sea area were investigated by G.Sh. Shamuratov [7] and M.K. Childebayev [3]. No special research has been made in the Orthoptera in the southern areas of Uzbekistan in the last 25 years.

2. Materials and Methods

The Orthoptera research was carried out between April and August 2023. We inspected the following areas in the insects' habitats: a wheat field; a wheat field after the wheat had been removed; an orchard; a corn field; a cotton field; a beet field; an orchard with alfalfa as; a bean field; and natural landscapes. During insects collection the tracks were recorded using GPS receivers.

The insects were collected as described in the standard protocol proposed by F.N. Pravdin [5]. We accepted the following abbreviations for the specification of a species' abundance: sg – single insects found (1-3 individuals per hour); rr – a rare species (4-10 inds/h); cm – a common species (11-20 inds/h); fr – a frequently occurring species which, however, does not form swarms (21-100 inds/h).

3. Results and Discussion

The information on the studied areas, brief characteristics and the quantitative data analyses regarding the collected individuals of Orthoptera are provided in Table 1. In the Baysun District the insects were collected from 7 different stations, Sherabad District – 6 stations, Angar, Termez and Denau Districts – 3 stations each. We also collected the insects in Kumkurgan and Saryasiya Districts. We determined the number of insects (males, females and larvae) collected in an hour. We also specified their species composition.

The research data established that the total number of individuals collected in the course of the study was 1,275 (Table 1), with 682 (53,6%) females, 390 (30,3%) males, and 293 (15,9%) larvae.

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The ratio of females to males was 1,7:1,0. In spring the largest portion of the insects is composed of larvae. So, the insects collected between 24 and 26 April comprised over 50% of larvae. Their natural development into mature forms leads to the reduction of their numbers towards summer. Species that breed several times a year produce larvae in summer time, too. The abundance of Orthoptera species varied across the stations. Baysun district showed the largest figure, with 100 individuals collected for 1 hour in an orchard on June, 18. Also, large numbers of the insects were caught in the corn field of Sherabad district (August 21), in the cotton fields of Angar district (June 20; August 22) and in the cotton fields and orchard of Jarkurgan district (August 23). The natural landscapes of Termez (August 22, 13 inds/h) and Baysun (August 21) districts yielded the smallest number of the insects. The largest number of Orthoptera species (17) was recorded in a fruiting orchard in Jarkurgan district and a mung bean field in Saryasiya district on 29 June. The smallest number of species was recorded in Termez (August 22) and Baysun (April 24) districts.

In the course of the research we have identified 54 Orthoptera species belonging to 38 genera (Table 2).

Totally, 12 Orthoptera species were recorded in the wheat fields, with 4 predominating species: *Pyrgomorpha bispinosa deserti* (larvae, imago), *Melanogryllus desertus* (larvae, imago), *Grullatalpa unispina* (larvae, imago) and *Platycleis intermedia* (larvae). As the wheat had been removed, the number of species reduced to 8 because of the migration of species *Tettigonia caudate*, *Tettigonia viridissma*, *Tetrix sudulata*, *Tetrix tartara tartara*, *Melanogryllus desertus, and Grullatalpa unispina*.

Table 1. The place, time and conditions in which the insects were collected, and their quantitative figures

№	Administrative district	No	Collection date	Number of collected individuals per hour				Number of species
				♀	♂	L	Total	
1	Baysun	1	24th April	12	5	19	36	12
2	Baysun	2	18th June	15	16	0	31	8
3	Baysun	3	24th April	3	2	18	23	6
4	Baysun	3	18th June	22	12	0	34	11
5	Baysun	3	21th August	9	9	0	18	6
6	Baysun	4	24th April	9	2	32	43	11
7	Baysun	4	18th June	65	32	3	100	11
8	Sherabad	3	20th August	16	5	3	24	8
9	Sherabad	3	22th August	27	17	1	45	13
10	Sherabad	3	21th August	17	7	3	27	8
11	Sherabad	5	25th April	13	5	16	34	11
12	Sherabad	5	19th June	30	16	6	52	16
13	Sherabad	5	21th August	38	20	2	60	12
14	Angar	6	26th April	22	16	10	48	14
15	Angar	6	20th June	44	25	0	69	14
16	Angar	6	22th August	36	24	7	67	15
17	Termez	6	22th August	18	15	6	39	7
18	Termez	3	22th August	8	5	0	13	5
19	Termez	7	22th August	24	16	7	47	12
20	Jarkurgan	4	27th April	7	7	25	39	10
21	Jarkurgan	4	23th August	39	21	1	61	17
22	Jarkurgan	6	23th August	53	31	2	85	16
23	Kumkurgan	6	23th August	34	15	1	50	13
24	Denau	6	24th August	29	16	6	51	15
25	Denau	8	27th April	15	9	32	56	8
26	Denau	8	24th August	35	22	3	60	15
27	Saryasiya	9	29th June	42	20	0	62	17
	Total			682	390	203	1275	
	%**:** average			53.6	30.5	15.9	47.2	

Note: 1 – Wheat field; 2 – Wheat field with wheat harvested; 3 – Natural landscape; 4 – Orchard;
5 – Corn field; 6 – Cotton field; 7 – Beet field; 8 – Orchard + alfalfa ; 9 – Bean field (mung beans).

Table 2. The species composition and abundance of Orthoptera in agrocenoses and adjoining natural sites in Surkhandarya province

No	Species	Types of landscape					
		1	2	3	4	5	6
1	*Tettigonia caudate*Charp.	sg	sg	-	-	rr	-
2	*Tettigonia viridissma* L.	sg	sg	sg	-	-	-
3	*Platycleis intermedia* Serv.	rr	sg	rr	rr	rr	sg
4	*Decticus albifrons P.*	-	-	-	-	rr	-
5	*Decticus verrucivorus* (L)	-	sg	-	-	rr	-
6	*Decticus sp.*	-	-	-	-	sg	-
7	*Glyphonothus alactaga* Miram	-	-	-	sg	-	-
8	*Phaneroptera falcata* (Poda)	-	-	-	-	sg	-
9	*Gryllusbimaculatus D*	sg	sg	rr	sg	-	-
10	*Melanogryllus desertus*	rr	rr	sg	rr	rr	-
11	*Modicogryllus bordigalensis*	-	-	sg	-	-	-
12	*Gryllodinus kerkennensis* (Finot)	-	-	-	sg	-	-
13	*Velarifictorusbolivari* (Uv)	-	-	-	-	-	sg
14	*Bothriophylax semonovi* Mir	-	-	sg	-	-	-
15	*Oecanthus turanicus*Uv.	-	rr	-	-	-	-
16	*Grullatalpa unispina*Sauss.	rr	-	sg	rr	sg	-
17	*Tetrixsudulata* Saulcy.	sg	rr	rr	sg	-	-
18	*Tetrixtartaratartara*Saulcy.	sg	cm	rr	rr	sg	-
19	*Pyrgomorpha bispinosa deserti.*	rr	rr	sg	-	rr	rr
20	*Pezotmethistartarus*(Sauss.)	-	-	-	-	-	sg
21	*Conophyma sokolovi modestum*	-	-	-	rr	-	sg
22	*Calliptamus italicus italicus*(L.)	-	rr	rr	-	-	-
23	*Calliptamus turanicus* Serg.Tarb	sg	rr	sg	rr	-	rr
24	*C.barbarus cephalotes*(Costa)	-	-	-	-	-	rr
25	*Heteracris adspersa* (Redt.)	-	-	rr	-	-	rr
26	*Heteracris pterosticha* (F.d.W.)	-	-	-	-	rr	-
27	*Egnatius apicalis* Stal.	-	-	-	-	-	sg
28	*Acrida oxycephala* (Pall.)	-	sg	sg	sg	rr	sg
29	*Truxalis eximia* Eichw	-	rr	-	-	rr	rr
30	*Duroniella kalmyka* (Ad.)	-	-	rr	-	sg	rr
31	*Duroniella gracilis* Uv.	sg	rr	rr	rr	rr	rr
32	*Aiolopus thalassinus* (F.).	-	rr	cm	-	cm	rr
33	*Helithera turanica* Uv.	-	sg	-	-	-	-
34	*Locusta migratoria migatoria* L.	-	rr	sg	sg	-	-
35	*Oedaleus decorus* (Germ.)	-	-	-	-	-	rr
36	*Oedaleus senegalensis* (Kr.)	-	-	-	-	-	sg
37	*Mioscirtus wagneri* (Kitt)	-	rr	-	-	-	sg
38	*Oedipoda miniata* (Pall.)	-	-	-	-	-	sg
39	*Oedipoda caerulescens* L.	-	-	-	-	-	rr
40	*Acrotylus insubricus inficitus*	-	rr	sg	rr	-	-
41	*Sphingonotus halocnemi* Uv.	-	-	-	-	-	sg
42	*Sph. maculatus maculatus* Uv.	-	-	-	-	-	-
43	*Sphingonotus nebulosus* (F.d.W).	-	-	-	-	-	sg
44	*Sph.rubescens rubescens* **(**F.Walk).		sg	-	-	sg	-
45	*Psevdoshingonotus savignyi* Sauss.	-	-	-	-	sg	sg
46	*Sphingoderus carinatus* (Sauss.)	-	-	rr	-	sg	-
47	*Helioscirtus moseri* Sauss.	-	-	-	-	-	sg

No	Species	Types of landscape					
		1	2	3	4	5	6
48	*Ramburiella foveolata* (Tarb.)	-	sg	sg	sg	-	rr
49	*Dociostaurus maroccanus* (Thunb)	sg	cm	rr	-	-	rr
50	*Dociostaurus tartarus* Uv .	-	-	sg	cm	-	-
51	*Notostaurusalbicornis* (Ev.)	-	-	-	-	-	sg
52	*Eremippus simplex simplex* (Ev.)	-	-	-	-	-	sg
53	*Chor.albomarginatuskarelini* (Uv.)	-	-	-	sg	-	rr
54	*Chorthippus meridionalis*	-	sg	sg	rr	-	-
	Total	12	24	24	18	19	28

Note: 1 – Wheat field; 2 – Cotton field; 3 – Corn field; 4 – Bean field (mung beans); 5 – Orchard + alfalfa; 6 – Natural landscape.

Table 3. The numbers of Orthoptera recorded in the cotton field. Angar District, April 22, 2023. Inds/h.Coordinates: N 37°24′56.4., E 067°09′59.3

No.	Species	Imago, inds.		Larvae, inds.	Total	%
		female	male			
1	*Tettigonia caudate*	2	-	-	2	2.9
2	*Tettigonia viridissma*	1	-	-	1	1.4
3	*Platycleis intermedia*	3	3	-	6	8.9
4	*Decticus verrucivorus*	1	-	-	1	1.4
5	*Gryllus bimaculatus*	3	-	-	3	4.4
6	*Oecanthus turanicus*	4	5	-	9	13.4
7	*Melanogryllus desertus*	1	1	-	2	2.9
8	*Calliptamus italicus italicus*	2	3	-	5	7.4
9	*Aiolopusthalassinus*	7	2	-	9	13.4
10	*Pyrgomorpha bispinosa deserti.*	1	2	3	3	4.4
11	*Acrida oxycephala*	2	-	-	2	2.9
12	*Truxalis eximia*	3	3	-	6	8.9
13	*Duroniella gracilis*	4	2	-	6	8.9
14	*Locusta migratoria migatoria*	2	3	-	5	7.4
15	*Helithera turanica*	-	-	4	4	5.9
Total		36	24	7	67	100

The cotton fields were characterised by a much more diverse of Orthoptera species composition. In the cotton field of Angar District 9 species were recorded in spring (April 26), 16 species in early summer (June 20) and 15 species in late summer (August 22). In total, 24 species were recorded. In early April, the predominating Orthoptera species in Angar District were *Tetrixtartaratartara* (22,9%), *Acrotylus insubricus* (12,6%), *Pyrgomorpha bispinosa deserti*, and *Melanogryllus desertus* (11,6% each). In early summer, the predominating species was *Dociostaurus maroccanus* (21,7%). In late August, species *Aiolopus thalassinus*, *Platycleis intermedia*, *Oecanthus turanicus*, *Truxalis eximia*, and *Duroniella gracilis* predominated in the cotton fields of Angar District (Table 3).

A corn field in Sherabad District was examined. The results of the examination are provided in Tables 1, 2 and 3. The insects were collected in the specified territories on April 25, June 19 and August 21. In spring the predominating species were *Dociostaurus maroccanus* (20,5%), *Pyrgomorpha bispinosa deserti*, and *Tetrix sudulata* (11.7% each). By early summer, the number of species grew from 11 to 16. Apart from Moroccan locust, other predominating species were *Sphingoderus carinatus*, *Duroniella kalmyka* and *Pyrgomorpha bispinosa deserti* (Table 4). By late August, the number of species dropped from 16 to 12. Imago of *Aiolopusthalassinus* (30,0%), *Calliptamus italicus italicus* (11,6%) and *Heteracris adspersa* (10%) predominated. In total, 24 Orthoptera species were recorded in the corn field.

In Saryasiya Districts a mung bean field was studied. In late June 62 individuals were collected and 17 species of Orthoptera were recorded (Table 5). The insects across the field were only on an imago stage. The predominating species were *Dociostaurus tartarus*, *Duroniella kalmyka* (12,9% each) and *Melanogryllus desertus* (11.2%). Totally, 18 species were recorded in the mung bean field.

In Denau District two orchards with alfalfa in the undergrowth were inspected. In addition, orchards in Baysun and Jarkurgan Districts were studied, and the species composition of Orthoptera established. The number and species composition of Orthoptera in the orchards with alfalfa were almost identical to those in ordinary orchards. In general, 19 Orthoptera species were recorded.

The species that predominated the orchard with alfalfa in Denau District comprised *Aiolopusthalassinus* (16,6%), *Pyrgomorpha bispinosa deserti* (11,6%), *Truxalis eximia*, and *Platycleis intermedia* (10% each) (Table 6). The most numerous species of the ordinary orchard in Jarkurgan District were *Pyrgomorpha bispinosa deserti* (13,1%), *Heteracris pterosticha* and *Platycleis intermedia* (11,4% each).

7 sites with natural landscapes in Baysun, Sherabad and Termez Districts were examined for Orthoptera. The natural sites were characterised by a great abundance of the insects and a wide range of species, with a total of 28 species recorded in this type of territory (Table 1 and 2). Table 7 provides data on the numbers of Orthoptera recorded in the reed beds of Sherabad District. In this district we recorded 13 species. The predominating ones were *Aiolopus thalassinus* (17,7%), *Duroniella gracilis*, and *Heteracris adspersa* (11.1% each).

Table 4. The numbers of Orthoptera recorded in the corn field, Sherabad District, June 19, 2023. Inds/h.Coordinates: N 37°38′37.1., E 067°00′48.2

No.	Species	Imago, inds.		Larvae, inds.	Total	%
		female	male			
1	*Tettigonia viridissma*	1	-	-	1	1.9
2	*Platycleis intermedia*	3	1	-	4	7.6
3	*Melanogryllus desertus*	2	2	-	4	7.6
4	*Modicogryllus bordigalensis*	1	-	-	1	1.9
5	*Grullatalpa unispina*	2	1	-	3	5.7
6	*Bothriophylax semonovi*	1		-	1	1.9
7	*Sphingoderus carinatus*	2	3	-	5	9.6
8	*Ramburiella foveolata*	1	1	-	2	3.8
9	*Acrotylus insubricus inficitus*	2	-	-	2	3.8
10	*Dociostaurus maroccanus*	4	2		6	11.5
11	*Acrida oxycephala*			3	3	5.7
12	*Duroniella gracilis*.	1	2	1	4	7.6
13	*Duroniella kalmyka*	3	2	-	5	9.6
14	*Locusta migratoria migatoria*	1	2	-	3	5.7
15	*Calliptamusturanicus*	3	-	-	3	5.7
16	*Pyrgomorpha bispinosa deserti.*	3	-	2	5	9.6
Total		30	16	6	52	100

Table 5. The numbers of Orthoptera recorded in the mung bean field, SaryasiyaDistrict,June 29, 2023. Inds/h.Coordinates:38°25′59.3., E 067°56′02.3

No.	Species	Imago, inds.		Larvae, inds.	Total	%
		female	male			
1	*Platycleis intermedia*	3	1	-	4	6.4
2	*Glyphonothus alactaga*	1	-	-	1	1.6
3	*Gryllus bimaculatus*	2	1	-	3	4.8
4	*Melanogryllus desertus*	4	3	-	7	11.2
5	*Gryllodinus kerkennensis*	1		-	1	1.6
6	*Grullatalpa unispina*	3	2	-	5	8
7	*Ramburiella foveolata*	2		-	2	3.2
8	*Acrotylus insubricus*	3	1	-	4	7.4
9	*Dociostaurus tartarus*	5	3	-	8	12.9
10	*Conophyma sokolovi modestum*	3	1	-	4	7.4
11	*Duroniella kalmyka*	5	3	-	8	12.9
12	*Locusta migratoria migatoria*	1	-	-	1	1.6
13	*Acrida oxycephala*	1	-	-	1	1.6
14	*Calliptamus turanicus*	3	1	-	4	7.4
15	*Tetrix sudulata*	1		-	1	1.6
16	*Tetrixtartaratartara*	3	1	-	4	7.4
17	*Chorthippus meridionalis*	2	2	-	4	7.4
18	*Ch. Albomarginatus karelini*	1	1	-	2	3.2
Total		42	20	-	62	100

Table 6. The numbers of Orthoptera recorded in the orchard with alfalfa as undergrowth. Denau District. 24 August 2023. Inds/h. Coordinates: N 38°16′14.5., E 067°55′42.6

No.	Species	Imago, inds.		Larvae, inds.	Total	%
		female	male			
1	*Tettigonia caudate*	3	-	-	3	5
2	*Platycleis intermedia*	4	2	-	6	10
3	*Decticus verrucivorus*	1	2	-	3	5
4	*Melanogryllus desertus*	3	1	-	4	6.6
5	*Grullatalpa unispina*	1	-	-	1	1.6
6	*Sphingoderus carinatus*	-	3	-	3	5
7	*Acrida oxycephala*	3	1	-	4	6.6
8	*Truxalis eximia*	3	3	-	6	10
9	*Duroniella gracilis*	3	2	-	5	8.3
10	*Duroniella kalmyka*	1		-	1	1.6
11	*Aiolopusthalassinus*	6	4	-	10	16.6
12	*Pyrgomorpha bispinosa deserti.*	4	3	-	7	11.6
13	*Tetrixtartaratartara*	-	1	3	4	6.6
14	*Sph.rubescens rubescens*	2	-	-	2	3.3
15	*Psevdoshingonotus.savignyi*	1	-	-	1	1.6
Total		35	22	3	60	100

Table 7. The numbers of Orthoptera recorded in natural landscapes. Reedbeds, Sherabad District, August 22, 2023. Inds/h. Coordinates: N 37°54′22.0, E 067°03′21.7 (0.4 inds/m^2)

No.	Species	Imago, inds.		Larvae, inds.	Total	%
		female	male			
1	*Platycleis intermedia*	1	1	-	2	4.4
2	*C.barbaruscephalotes*	-	1	-	1	2.2
3	*Heteracris adspersa*	3	2	-	5	11.1
4	*Acrida oxycephala*	2	-	-	2	4.4
5	*Truxalis eximia*	4	3	-	7	15.5
6	*Duroniella gracilis*	4	1	-	5	11.1
7	*Duroniella kalmyka*	1	3	-	4	8.8
8	*Aiolopusthalassinus*	5	3	-	8	17.7
9	*Pyrgomorpha bispinosa deserti.*	2	-	1	3	6.6
10	*Oedipoda caerulescens*	1	-	-	1	2.2
11	*Sphingonotus nebulosus*	1	1	-	2	4.4
12	*Psevdoshingonotus.savignyi*	1	-	-	1	2.2
13	*Chor.albomarginatus karelini*	2	2	-	4	8.8
Total		27	17	1	45	100

Our research demonstrated that natural landscapes featured the greatest diversity of Orthoptera (28 species), followed by cotton and corn fields (24 species each), orchards (19 species), a mung bean field (18 species) and a wheat field (12 species). The following species compositions were recorded in different types of landscape in Karakalpakstan: cotton fields – 29 species, wheat and rice fields – 11 species each, melon fields – 8 species, orchards with alfalfa – 7 species and fallow fields – 3 species by Childebayev et al. [3]. In South-West Tajikistan 26 species were recorded in cotton fields, 4 in wheat fields and 24 in alfalfa fields by Chernyakhovsky [2].

4. Conclusions

The Orthoptera species that predominated the studied sites were Platycleis intermedia, *Oecanthus turanicus, Melanogryllus desertus, Heteracris adspersa, Truxalis eximia, Duroniella gracilis, Duroniella kalmyka, Aiolopusthalassinus, Pyrgomorpha bispinosa deserti, Dociostaurus tartarus, Dociostaurus maroccanus*, and *Calliptamus italicus italicus*. The last two species are swarming locusts that tend to cause serious damage of various cultivated plants. Favourable weather conditions may lead to a sudden and considerable rise in the numbers of these insects, which may pose a

serious threat to agricultural lands. Large numbers of Italian locust were recorded in alfalfa fields in South-West Tajikistan and various agrocoenoses in Karakalpakstan by M.Ye. Chernyakhovsky (1982) and M.K. Childebayev et al. (2011). The presence in the agrocoenoses of three swarming species, Moroccan, migratory and Italian locusts, makes it necessary to control their numbers on a regular basis. The species diversity and numbers of Orthoptera in agrocoenoses are highest in June and August.

Orthoptera species from 38 genera in various agrocoenoses and adjoining natural sites in Surkhandarya province were identified. There were 28 species found in natural landscapes, 24 in cotton fields, 24 in corn fields, 19 in orchards, 18 in mung bean fields, and 12 in wheat fields. The species diversity and numbers of Orthoptera in agrocoenoses were highest in June and August. The presence in the agrocoenoses of three swarming species, Moroccan, migratory and Italian locusts, makes it necessary to control their numbers on a regular basis.

REFERENCES

[1] Bekuzin A. A. The Locust Fauna of the Sultan-Uizdag Range and Adjacent Areas // Bulletin of the Karakalpak Department of the Academy of Sciences of the UzSSR, 1962, 1(7), PP. 84-91.

[2] Chernyakhovsky M. Ye. The Formation of the Locust Fauna in the Agrocoenoses of South Tajikistan // The Formation of the Animal and Microbial Population in Agrocoenoses. Thesis of a Report at an All-Union Meeting, Moscow, Puschino, 1982. PP. 62-63.

[3] Childebayev M. K., Nurzhanov A. A., Medetov M. Zh. Orthopterous insects (Insecta: Orthoptera) in the agrocoenoses of Karakalpakstan (Uzbekistan) // Almaty. Kazakh National Agrarian University, 2011. PP. 76-83.

[4] Ergashev N. Ye. The Orthoptera of the Karshi Steppe. Biology, Species Composition, Ecology and Distribution // Tashkent: Fan, 1982. 75 pages.

[5] Pravdin F. N. The Ecological Geography of Insects in Central Asia. – Moscow: Nauka, 1978. 270 pages.

[6] Sergeyev M. G., Bugrov A. G. Orthoptera in the agrocoenoses of South-West Tajikistan. Preliminary Report // Anthropogenic Impacts on Insect Communities. Novosibirsk, 1985. PP. 134-138.

[7] Shamuratov G. Sh., Kopaneva L. M. 1984. Acridoidea in Karakalpakia // Nukus, Karakalpakstan, 112 pages.

[8] Tokgayev T. B. 1972. The Fauna and Ecology of Acridoidea in Turkmenistan // Ashkhabad: Ylym, 224 pages.