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Composition, Distribution And Zoogeographic Features Of Species Of Ground Beetles (Coleoptera, Carabidae) In Northwestern Uzbekistan

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Abstract. This article highlights the results of research on the general biological and faunistic study of ground beetles (Coleoptera, Carabidae) in the northwestern regions of Uzbekistan. In line with the regional distribution of studied ground beetles, 36 (34.6%) species were found in Ustyurt, 59 (56.7%) species in the Kyzylkum desert landscape, 30 (28.8%) species in the Lower Amudarya biosphere reserve, and 52 (50%) species and subspecies in the agrocenoses.

Actuality of the topic. Ground beetles are insects that are common in all natural and anthropogenic environments and effectively kill agricultural pests.

The fauna of Uzbekistan is rich and diverse. This situation is reflected in various historical studies of the formation of the fauna and the diversity of species in the country, and is determined by the fact that its natural conditions have a completely unique character.

O.L. Krijanovsky studied the systematization of ground beetles. He paid great attention to the fauna of Central Asia, including Uzbekistan. His scientific work, called 'The Central Asian Carabus Beetle' written in 1953, summarizes many years of research. Moreover, the collections of scientists of the Institute of Zoology and Parasitology, including A.G. Davletshchina, R.A. Olimjanov, M.A. Radzivilovskaya and others, are noteworthy in the study of the fauna of ground beetles in Uzbekistan. Especially, the services of V.V.Yakhontov were of great importance, as he worked hard to study the entomofauna of Uzbekistan and his work are still effectively used to generalize the fauna of the ground beetles. V.V. Yakhontov, A.G. Davletshchina and others listed 31 species of ground beetles in their scientific work 'World of Mirzachul animals'. R.A.Alimjanov points out the harmfulness of Zabrus Clairville, 1806 beetles (1972) in the south of Uzbekistan. The Tashkent Museum of Nature plays an important role in the study of the entofauna of Uzbekistan. In particular, the museum includes the rich collections by L.S. Zimin from Khorezm (1992), by V. Motov from Namangan, by I.V. Yankovsky from mountainous areas of Tashkent region and from Tashkent region (1928–1931), by M.N. Churkun from Syrdarya and Fergana valley (1939 – 1940), by N.I. Fursov from Kashkadarya (1946) and others [1,2,3,4].

Furthermore, the analysis of research on the study of ground beetles in the north-western regions of Uzbekistan showed that research on the study of beetles in these areas has not been completed yet. Therefore, the study of ground beetles in the north-western regions of Uzbekistan from a general biological and faunistic point of view is relevant.

Materials and methods. In order to study the ground beetles in the northwestern regions of Uzbekistan, the collection of samples was carried out on the designated routes and in the designated areas, mainly in Ustyurt Plateau, Lower Amudarya State Biosphere Reserve, agrocenosis and in the territory of the Aral Sea massif which appeared in the dry basin of the Kyzylkum and the Aral Sea as desert areas.

The collection of samples of ground beetles was carried out using general anthropological methods and methods developed for the study of Coleopteras. The collection of insects using the entomological grip method was carried out as follows: that is, the handle is held with one hand in such a way that the last part of the stick reaches at least the elbow. Its ring part is placed in a position perpendicular to the ground surface or to a bush or a tree. The handle was then moved rapidly across the plant. In this case, the impact force of the handle on the plant is of great importance (Golub 1998).

Mainly using entomological handles, by installing various traps, in which a series of bottles or jars, plastic cups are buried in the ground at a few meters distance and 10% acetic acid or 70% alcohol is poured into the containers. Moreover, light-assisted catchers are relatively effective for catching nocturnal insects, providing excellent results in the study of entamofauna. It is also possible to catch insects flying in the light of the lamp (using a lantern) with the help of a handle. Most adult ground beetles are active only during certain periods of the field season, which means that they can only be collected at this time. Thus, entomofauna of spring (late April-second decade of May), late spring (third decade of May-beginning of June), early summer (June), summer (early July-August), late summer (early August-September) and autumn (mid-September-October) aspects can be distinguished. For each species there are self-seasonal maximums and minimums in terms of activity. For example, most Coleoptera are particularly colorful in late spring and early summer, while species considered in mid-July have shown a sharp decline in diversity and their abundance (development occurs in most species at this time), the second peak of diversity (less pronounced) usually was observed in early August-September, when a new generation imago was emerging [1,3].

Faunistic and taxonomic structure of ground beetles in the northwestern regions of Uzbekistan.

During the study, 104 species and subspecies belonging to 39 genera, 7 subfamilies of ground beetles were identified in the northwestern regions of Uzbekistan. When we analyzed the biodiversity of these identified beetles in the subgroups, we found that while the most common species belong to Harpalinae, which includes 32 species with a maximum of 19 genera, the least common species are the Omophroninae subfamily with at least 1 genera, whereas the Broscinae subfamily showed to be 2 genera and 5 species (Table 1).

Table 1. Taxonomic structure of ground beetles in the northwestern regions of Uzbekistan

Family	Subfamily	Number of genera	%	Number of species	%
	Omophroninae	1	2.56	1	0.96
	Cicindelinae	2	5.13	12	11.54

	Carabinae	5	12.82	9	8.65
Carabidae	Scaritinae	3	7.69	20	19.23
	Broscinae	2	5.13	5	4.81
	Harpalinae	19	48.72	32	30.77
	Pterostichinae	1	2.56	8	7.69
	-	6	15.38	17	16.35
Total	7	39	100	104	100

In line with the regional distribution of studied ground beetles, 36 (34.6%) species were found in Ustyurt, 59 (56.7%) species in the Kyzylkum desert landscape, 30 (28.8%) species in the Lower Amudarya biosphere reserve, and 52 (50%) species and subspecies in the agrocenoses (Table 2).

Table 2. Regional distribution and the number of ground beetles in the northwestern regions of Uzbekistan

	Subfamily, Species and subspecies	Ustyurt	Lower Amudarya biosphere reserve	Agrocenoses	Desert	
					Aralkum	Kyzylkum
1	Omophron limbatum F., 1828	-	-	++	-	-
2	Megacephala euphratica armeniaca Cast., 1834	-	-	++	+	+
3	Cicindela contorta F. – W., 1828	+	+++	+++	-	-
4	C. deserticole Fald., 1836	-	+++	-	-	++
5	C.galatheaThieme., 1881	-	-	-	-	+
6	C. Lacteola Pall., 1776	+	-	-	-	+
7	C. (L.) littorals F. 1787	++	++	+++	-	-
8	C.melancholicaF., 1798	+	-	-	-	+
9	C. nox Sem., 1886	-	++	+	++	-
10	C. oblique fasciata Ad., 1817	+	-	+	-	++
11	C. orientalis Dej., 1825	++	-	-	-	-
12	C. sturmi Men., 1832	-	-	+	-	-
13	C.sublacerata Sols., 1974	-	++	-	-	+
14	CalosomaalalgirisumGehin., 1835	-	-	-	+++	+
15	C. auropunctatum subsp.dzungaricum Gebl., 1835	-	++	+++	-	+++
16	C. imbricatumdesertikola Sem., 1897	-	-	-	+++	++
17	C. olivieri Dej., 1831	+	-	-	-	+
18	C. reitteri Roe., 1896	+	-	-	-	+
19	CymbionotumplctulumH.Bates., 1874	-	++	+++	-	-
20	Siagonaeuropaea Dej., 1826	+	-	-	-	-

21	CoryzacarinifronsRtt. 1955	-	-	-	-	+
22	Carabus (Ulocarabus) stschorovskii Sols, 1874	-	+++	-	-	-
23	Clivina ypsilon Dej., 1829	-	-	+	-	-
24	DyschiriusapicalisPutz., 1846	+	-	-	+	+
25	D. arcifer Zn., 1928	-	+	-	-	-
26	D.caspiusPutz., 1866	+	-	+	-	+
27	D. cylindricos	-	-	+	-	+
28	D.extensusPutz., 1846	+	-	-	-	-
29	D. humereatusChaud., 1850	+	++	+	-	-
30	D. Lucidus Putz., 1846	+	-	-	-	-
31	D. luticola Chaud., 1850	-	-	++	-	-
32	D. pusillus Dej., 1825	-	++	+++	-	-
33	D. salinusSchaum., 1843	-	-	+	-	-
34	D.strumosus Dej., 1825	+	-	-	-	-
35	D. syriacus Putz., 1868	+	-	-	-	-
36	D. zimini Zn. 1928	-	-	+	-	+
37	Scarites angustus Chaud, 1855	-	++	+++	-	+++
38	Scarites bucida Pall., 1776	-	-	-	+++	+
39	S. cylindronotusFald., 1836	-	++	++	-	-
40	S.eurytus F.-W., 1825	-	-	++	-	+
41	S. planus Bon., 1813	++	-	-	-	-
42	S. terricola Bon., 1813	-	-	-	-	+
43	Broscus punctatus Dej. 1823	+	-	-	-	+
44	B.semistriatus F. – W., 1823	-	+	+		+
45	B. semistriatus asiaticus Ball., 1871	-	-	+	-	-
46	Craspedonotus margelanicus Krants 1834	-	-	+	-	-
47	Bembidion (Pogonidium) laevibase Rtt., 1902	+++	-	+++	-	-
48	B (Chlorodium) almum J.Sahlb., 1900	++	-	-	+++	-
49	B. (Ch). Luridicorne Sols., 1874	-	-	-	-	+
50	B. (Notaphocampa) niloticum Dej, 1831	-	++	++	-	++
51	B. (Emphanes) latiplagaChd. 1850	-	-	+++	+++	++
52	B. (E.) tenellum ssp.buchariplaga Nat., 1943	-	-	++	-	++
53	B.(Semicampa) gassneri Net., 1922	-	-	++	-	-
54	B.(P.) atlanticumssp.magaspllumvalk., 1871	-	-	++	-	-
55	T.(P.) turkestaniucsCsiki, 1923	+	+++	-	+	-
56	T.(P.) centriustatus Rtt, 1894		++	-	-	-
57	Pagonus virens Men. 1849		-	+		+
58	Pogonistus (Syrdenus) grayiWoll., 1862	+	-		+	+

59	Chlaenius (tricliochlaenius) stoveni Quens., 1806		-	+		+
60	Ch. (Chlaenites) inderiensisMotsch., 1858	+	-	-	-	+
61	Ch (Ch.) spoliatus Rossi., 1790	-	-	-	-	+
62	Ch. (s.str.) festivus Pariz., 1796	-	-	+	-	-
63	Ch. (Ch.) tristisSchall., 1783	-	++		-	-
64	Badister (s.str) anomalus Perris.,	-	-	+	-	-
65	Pt. (P) subcoeruleus Quens., 1896	-	++	+	-	-
66	Pt. (Angoleus) nitons chaud., 1850	+	-		-	-
67	Pt. (Derus) innatusGlas., 1908	-	-	+	-	-
68	Agonium (s.str.) atratumDuft., 1812	-	-	+	+	+
69	A.(s.str.) extensum Men., 1849		+++	+	-	-
70	A.(s.str.) punctibaseRtt., 1894	+	-	-	-	-
71	A.(Europhilus) chivense Lutchn., 1934	-	-	+	-	-
72	Tephoxenus gracilis Zubk., 1833	+	-	-	-	+
73	CalathusambiguusPayk., 1790	-	+	-	-	-
74	Amara (s.str.) aenea Deg., 1774	-	+++	-	++	++
75	A.(s.str.) ovata F., 1792	-	++	-	-	+++
76	A.(s.str.) similata Gyll.,1810	-	-	+	-	-
77	A.(C.) ingenua Duft., 1812	+	-	-	-	-
78	A.(C.) tescicola Zimm., 1831		-	-	-	+
79	A.(Amathitis) faedtschenkoi Tach., 1898	+	++	+	-	+
80	A.(Bradytus) apricaria Payk., 1790	-	-	+	-	-
81	Curtonotus propinquus Men., 1832	-	+		-	-
82	Zabrus morio Men., 1832	+++	-	++	+	+++
83	Machozetes concinnus Dohrn., 1885	+	-	-	-	+
84	M.lehmanni Men., 1849	-	-	-	-	+
85	Carenochirus titanus Sols., 1874	-	-	-	-	+
86	DitomussemicylindricusPioch. 1872	-	+	+	-	-
87	Deptus vittatus F.-W., 1824	-	-	+	-	-
88	Acionopus(Haplacinopus) striolatusZubk., 1833	+	-	-	-	+
89	Ophonus.(Pseudoophonus) griseusPanz., 1792		-	+++		++
90	O.(Pseudoophonus) calceatusDuft., 1812	+	-	+		
91	Harpalus (s.str.) distinquendus Duft., 1812	-	-	++	++	-
92	H.(s.str.) sublaevigatusTschitsch 1898	-	-	-	-	+
93	Dicheirotrichus ustulatus Dej., 1829		++	+	+	+
94	Anisodactylus (Hexatrichus peudoaeneus Dej., 1829	+	-	-	+	+
95	Mnuphorussellatus Gebl 1843	+	-	-	-	-

96	MetabletusFuscomaculatus Motsch., 1844	+	-	-	-	+
97	M.negrita Woll. 1854	-	+++	+	-	+
98	M.polituus Rtt. 1950	-	++	-	-	+
99	Cymindis (s.str.) accentifera Zoubk 1833	-	-	-	-	+
100	C. (Iscariotes) triangularis Rtt. 1897	-	-	-	-	+
101	Agatus flavipes Sols., 1874	-	-	-	+	+
102	Discoptera komarovi Sem 1889	-	+	+	-	+
103	Zuphium bactrianum Dan., 1893	-	-	+	-	-
104	Zuphium olens Rossi 1790	+	-	+	-	+
Total	104	36	30	52	17	55

In terms of species composition, when we compare the scientific data we collected from the Kyzylkum Desert area, it is much closer to the previous data by Davletshina 1979., differing only in the fact that some mesophilic species are not found in this area and the number of desert and semi-desert species increases. In line with the regional distribution of studied ground beetles, 36 (34.6%) species were found in Ustyurt landscape, 59 (56.7%) species in the Kyzylkum, that is desert landscape, 30 (28.8%) species in the Lower Amudarya biosphere reserve, and 52 (50%) species and subspecies in the agrocenoses. In particular, such species as Omophron limbatum F., 1828, Cicindela sturmi Men., 1832, Clivina ypsilon Dej., 1829, Broscus semistriatus asiaticus Ball., 1871, Craspedonotus margelanicus Krants 1834 , Chlaenius (s.str.) festivus Pariz., 1796, Badister (s.str) anomalus Perris., Pt. (Derus) innatusGlas., 1908, Agonium (Europhilus) chivense Lutchn., 1934, Amara (s.str.) similata Gyll.,1810, A.(Bradytus) apricaria Payk., 1790, Deptus vittatus F.-W., 1824 , Zuphium bactrianum Dan., 1893 каби турлар фақат агроценозда, Cicindela contorta F. – W., 1828, C. (L.) littorals F. 1787 C. auropunctatum subsp.dzungaricum Gebl., 1835, Scarites angustus Chaud, 1855, Bembidion (Emphanes) latiplagaChd. 1850, Amara (s.str.) aenea Deg., 1774, Zabrus morio Men., 1832 were found in relatively large numbers, occurring in at least three landscapes.

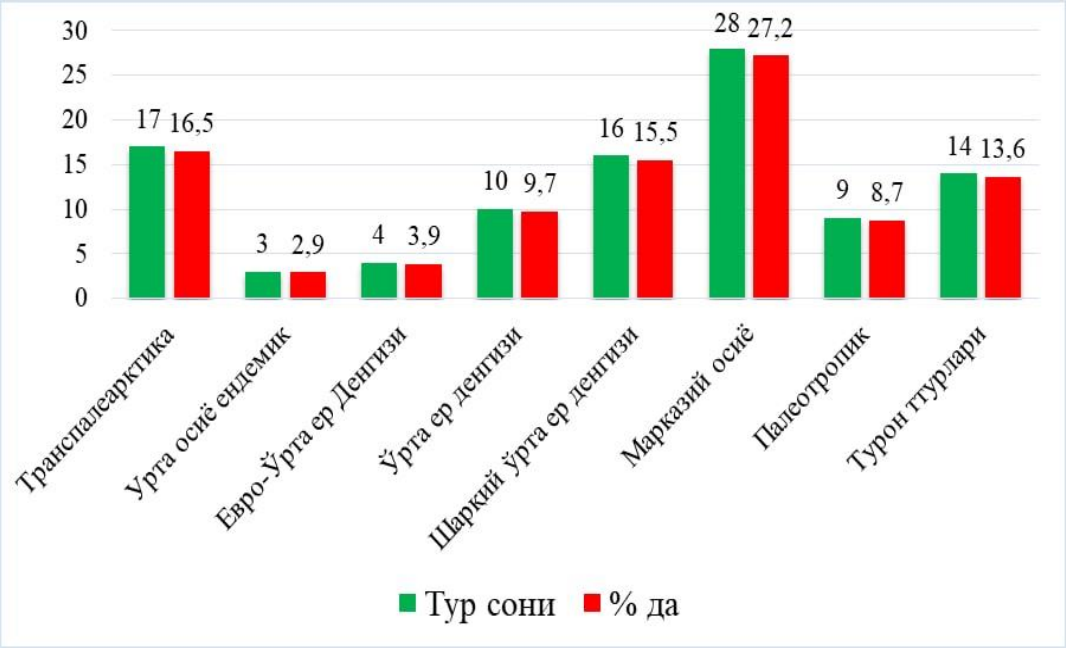
According to the data obtained, the number of species is the lowest in the Ustyurt plain, and the highest in the desert and agrocenosis. Also, the degree of similarity was determined using P.Jaccard similarity coefficient and the analysis was performed. At the same time, the highest level of similarity was in the Lower Amudarya Biosphere Reserve - Agrocenosis 28%, and the lowest in the Ustyurt-Lower Amudarya Biosphere Reserve - 0.082%. Species in the Ustyurt Plain show that they belong to the desert and semi-desert group (Table 3).

Table 3. The coefficient of similarity of the fauna of the compared ground beetles

Regions	Ustyurt Plain	Desert	Lower Amudarya Biosphere Reserve	Agrocenosis
Ustyurt Plain	1	-	-	-
Desert	0,22	1	-	-
Lower Amudarya Biosphere Reserve	0,8	0,19	1	-
Agrocenosis	0,13	0,22	0,28	1

Zoogeographic analysis of ground beetles in the study area. The range of a species is a large area or aquaarea with a certain amount of ecological conditions for the species. This ecological-geographical environment of the species is complicated by changes in natural conditions in the past- climate, vegetation, landforms, etc., so this species range is a combination of modern and previous conditions. As a result, a number of changes and peculiarities in the geographical distribution of species and their complexes - plant flora and fauna for animals are observed. For most species, the range occurs geographically without clear large gaps, but in many species it has changed, i.e., has intermediate voids, often resulting from radical changes in environmental conditions.

Species belonging to the fauna of the studied ground beetles were represented by zoogeographical areas such as Transpalearctic, Central Asian endemic, Euro-Mediterranean, Mediterranean, Eastern Mediterranean, Central Asia and Kazakhstan, Paleotropic, Turan (Graph 1).



Graph 1. Zoogeographical grouping of ground beetles in northwestern Uzbekistan

In summary, during the study, 104 species and subspecies belonging to 39 genera, 7 subfamilies of ground beetles were identified in the northwestern regions of Uzbekistan. In line with the regional distribution of studied ground beetles, 36 (34.6%) species were found in Ustyurt landscape, 59 (56.7%) species in the Kyzylkum,that is desert landscape, 30 (28.8%) species in the Lower Amudarya biosphere reserve, and 52 (50%) species and subspecies in the agrocenoses. According to the results of zoogeographic analysis of the fauna, the majority of species of Carabidae living in the territory of northwestern Uzbekistan are species of Central Asia and Kazakhstan, as their total fauna composition is 28 species, 27.2%. In second place in terms of the number of species are Transpalearctic 17 species 16.5%, and accordingly the Eastern Mediterranean group 14 species 15.5%, Turan group 13.6%, Mediterranean species 9.7%, Paleotropic species 8.7%, Euro-Mediterranean species 3.9% , th least is Central Asian endemic species 2.9%. This distribution of species reveals the laws of their distribution around the earth and the positive and negative consequences that occur in practice as a result of their activities.

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