

Composition and structure of the fauna of ground beetles (Coleoptera, Carabidae) of the Zerafshan Range

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The article presents the results of studying the fauna of ground beetles in the western part of the Zerafshan Range (Uzbekistan). The Carabidae list includes 81 species from 41 genera, 18 tribes and nine subfamilies. The ecological diversity of the ground beetle fauna is analyzed on three parts of the ridge. The greatest diversity of Carabidae is noted in the Karatepo Mountains (74 species), and the smallest in the Zirabulak-Ziyadin Mountains (54 species). The fauna of the ground beetles of the Chakalikalyan and Karatepa Mountains are closer to each other (Jaccard index – 0.79, Chekanovsky-Sørensen coefficient – 0.89). The lowest value of the similarity coefficients was noted between the Chakalikalyan and Zirabulak-Ziadin Mountains (0.64; 0.78). The most numerous are *Anchomenus dorsalis* (10.46%), *Calathus ambiguus* (8.23%), *Amara aenea* (7.48%) and *Harpalus rufipes* (6.03%).

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Keywords

Degree of dominance, ground beetles, species abundance, species composition, Zerafshan Range

Introduction

Ground beetles are a very large and diverse taxon among beetles, and about 100 new species are discovered every year (Kotze et al. 2011). They are an important link in food chains and thus play a huge role in energy transformation (Schirmel et al. 2012). They are sensitive to environmental changes, showing strong habitat specificity and low ability to quickly spread to neighboring sites (Work et al. 2008; Koivula 2011). Therefore, ground beetles have been widely used for ecological monitoring (Skalski et al. 2016; Kosewska et al. 2016; Bell et al. 2017; Kędzior 2020).

Many species of ground beetles, as universal predators with a wide food spectrum, can act as an essential component of biological regulation (Symondson et al. 2002; Stiling and Cornelissen 2005). And in agricultural landscapes, they play a very significant role in reducing the number of pests (Koval and Guseva 2008, Halimov 2020) and weeds (Talarico et al. 2016, Deroulers and Bretagnolle 2019).

The beetle fauna of Central Asia is very diverse and is characterized by many endemic forms. So, in the Tien Shan mountain system, within the republics of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, 819 species of ground beetles were noted. And the fauna of ground beetles of the Pamir-Alai mountain system, located in the southeastern part of Middle Asia, includes 510 species (Kryzhanovsky et al. 1995).

The invertebrate fauna of the Zeravshan Range is still poorly understood, although in recent years some works have appeared on individual groups (Khalimov 2020, Narzullaev 2022).

Information about the fauna of the ground beetles of the Zarafshan valley can be found in general faunal studies (Alimdzhanov and Bronshtein 1956) or for the southern slopes of the Zarafshan ridge, located on the territory of Tajikistan (Mikhailov 1998). We previously reported the distribution of 49 species of ground beetles in this area (Khalimov 2020).

The purpose of our research was to study the species diversity and taxonomic composition of the ground beetles of the Zeravshan Range within the Republic of Uzbekistan.

Materials and methods

The studies were carried out in the period 2018–2022. The Zarafshan range on the territory of Uzbekistan is divided into four parts: the Chakilkalyan, Karatepa, Zirabulak and Ziadin mountains (Fig.1). The Chakilkalyan Mountains are the eastern part of the Zeravshan Range within Uzbekistan. The average height of the Chakilkalyan Mountains is 1000–2000 m. To the west of the Chakilkalyan Mountains are the Karatepa Mountains (the average height is 1000–2000 m). The western part of the Zeravshan ridge is formed by the Zirabulak and Ziadin mountains, which have the character of low mountains, the average height of which is 400–900 m (Zhumaev 1989).

Each of the above-mentioned parts of the Zeravshan Range has a peculiar hydrothermal regime and vegetation cover.

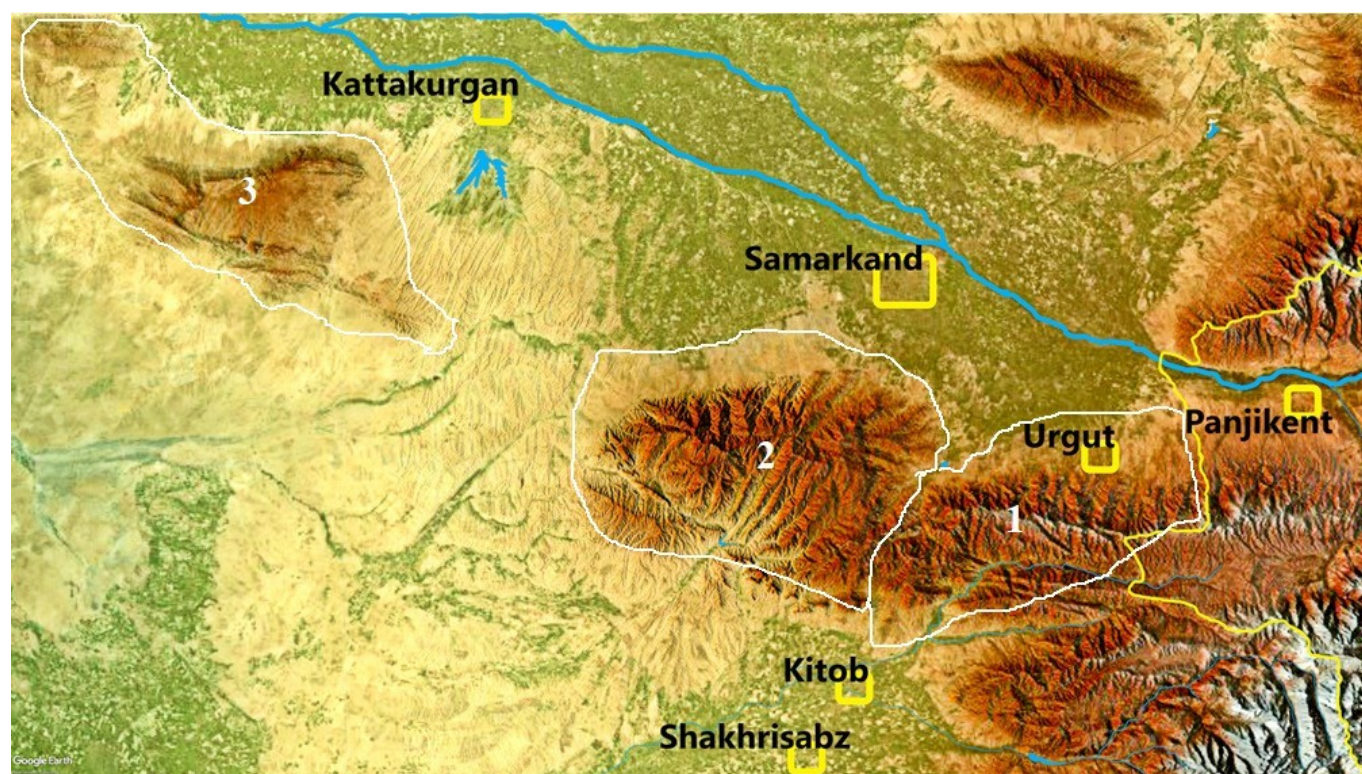


Figure 1. Research map (1-Chakalikalyan mountains, 2-Karatepa mountains, 3-Zirabulak and Ziadin mountains).

The beetles were collected using soil traps, light traps, an exhauster, and manual collection. The ground beetle system is given according to the Catalogue of Life (Lorenz 2021). The examined specimens are kept in the Entomological collection of Samarkand State University.

The degree of dominance was determined according to the Renkonen scale (Renkonen 1944), where more than 5% are dominant species, from 2% to 5% are subdominant species, 1-2% are few, and less than 1% are rare species.

Statistical calculations of biodiversity were carried out according to the guidance of E.A. Dunaev (1997).

Result

Over the years of research, 2686 beetle specimens belonging to nine subfamilies, 18 tribes, 41 genera and 81 species were collected (Table 1).

Subfamily	Tribe	№	Species name
Nebriinae	Nebriini	1.	<i>Nebria psammophila</i> Solsky, 1874
		2.	<i>Notiophilus sublaevis</i> Solsky 1873
Cicindelinae	Cicindelini	3.	<i>Cicindela turkestanica</i> Ballion, 1871
		4.	<i>Cicindela fischeri</i> M.Adams, 1817
Omophroninae	Omophronini	5.	<i>Omophron rotundatum</i> (Fabricius, 1777)
Carabinae	Carabini	6.	<i>Calosoma sycophanta</i> Linnaeus, 1758
		7.	<i>Calosoma auropunctatum</i> Gilber, 1833
		8.	<i>Carabus fedtschenkoi</i> Solsky, 1874
		9.	<i>Carabus staudingeri</i> Ganglbauer, 1886
Brachininae	Brachinini	10.	<i>Brachinus bayardi</i> Dejean, 1831
		11.	<i>Brachinus brevicollis</i> Motschulsky, 1844
		12.	<i>Brachinus explodens</i> Duftschmid, 1812
		13.	<i>Mastax thermarum</i> Steven, 1806
Scaritinae	Clivinini	14.	<i>Clivina collaris</i> Herbst, 1784
	Scaritini	15.	<i>Scarites basiplicatus</i> Heyden, 1884
		16.	<i>Scarites procerus</i> Fischer von Waldheim, 1828
		17.	<i>Scarites subcylindricus</i> Chaudoir, 1843
Broscinae	Broscini	18.	<i>Scarites terricola</i> Bonelli, 1813
		19.	<i>Broscus asiaticus</i> Ballion, 1871
		20.	<i>Broscus punctatus</i> Dejean, 1828

		21.	<i>Craspedonotus margellanicus</i> Kraatz, 1884
Trechinae	Bembidiini	22.	<i>Asaphidion flavicorne</i> Solsky, 1874
		23.	<i>Bembidion abbreviatum</i> Solsky, 1874
		24.	<i>Bembidion almum</i> J. Sahlberg, 1900
		25.	<i>Bembidion insidiosum</i> Solsky, 1874
		26.	<i>Bembidion kirgisorum</i> Netolitzky, 1934
		27.	<i>Bembidion lampros</i> (Herbst 1784)
		28.	<i>Bembidion luridicorne</i> Solsky, 1874
		29.	<i>Bembidion quadrimaculatum</i> Linnaeus, 1761
		30.	<i>Bembidion quadripustulatum</i> Audinet-Serville, 1821
		31.	<i>Bembidion piceocyaneum</i> Solsky, 1874
		32.	<i>Bembidion saxatile flavipalpe</i> Netolitzky, 1930
	Tachyini	33.	<i>Elaphropus tetraspilus</i> (Solsky, 1874)
		34.	<i>Tachyura euphratica</i> Reitter, 1885
		35.	<i>Tachys turkestanicus</i> Csiki, 1928
	Trechini	36.	<i>Trechus quadristriatus</i> Schrank, 1781
		37.	<i>Chlaenius circumscriptus</i> (Duftschmid, 1812)
		38.	<i>Chlaenius festivus</i> Panzer, 1796
		39.	<i>Chlaenius flavicornis</i> Fischer, 1842
		40.	<i>Chlaenius extensus</i> Mannerheim, 1825
		41.	<i>Chlaenius semicyaneus</i> Solsky, 1874
		42.	<i>Chlaenius tenuilimbatus</i> Ballion, 1871
	Harpalini	43.	<i>Acinopus laevigatus</i> Menetries, 1832
		44.	<i>Acinopus striolatus</i> Zoubkoff, 1833
		45.	<i>Acupalpus parvulus</i> (Sturm, 1825)
		46.	<i>Anisodactylus binotatus</i> Fabricius, 1787
		47.	<i>Carenochyrus titanus</i> Solsky, 1874
		48.	<i>Chilotomus usgentensis</i> Schaubberger, 1932
		49.	<i>Ditomus calydonius</i> Rossi, 1790

		50.	<i>Dixus eremita</i> Dejean, 1825
		51.	<i>Dixus semicylindricus</i> Piochard de la Brûlerie, 1872
		52.	<i>Eocaraterus chodshenticus</i> Ballion, 1871
		53.	<i>Harpalus distinguendus</i> Duftschmid, 1812
		54.	<i>Harpalus griseus</i> Panzer, 1796
		55.	<i>Harpalus rufipes</i> De Geer, 1774
		56.	<i>Harpalus rubripes</i> Duftschmid, 1812
		57.	<i>Harpalus tenebrosus</i> Dejean 1829
		58.	<i>Parophonus hirsutulus</i> (Dejean, 1829)
		59.	<i>Stenolophus abdominalis</i> Mannerheim, 1844
	Lebiini	60.	<i>Cymindis andreae</i> Ménétries, 1832
		61.	<i>Cymindis quadrisignata</i> Menetries, 1848
		62.	<i>Lebia</i> <i>cyonocephala</i> Linnaeus, 1758
		63.	<i>Lebia festiva</i> Faldermann, 1836
		64.	<i>Lebia scapularis</i> (Geoffroy, 1785)
	Platynini	65.	<i>Agonum viridicupreum</i> Goeze, 1777
		66.	<i>Anchomenus</i> <i>dorsalis</i> Pontoppidan, 1763
	Pterostichini	67.	<i>Poecilus cupreus</i> Linnaeus, 1758
		68.	<i>Poecilus liosomus</i> Chaudoir, 1876
		69.	<i>Poecilus longiventris</i> Solsky, 1874
		70.	<i>Poecilus</i> sp.
		71.	<i>Pterostichus niger</i> Schaller, 1783
	Sphodrini	72.	<i>Calathus ambiguus</i> Paykull, 1790
		73.	<i>Calathus</i> <i>melanocephalus</i> Linnaeus, 1758
		74.	<i>Calathus peltatus</i> Kolenati, 1845
		75.	<i>Dolichus halensis</i> Schaller, 1783
		76.	<i>Pseudotaphoxenus</i> <i>juvencus</i> (Ballion, 1871)
		77.	<i>Taphoxenus</i> <i>goliath</i> Faldermann, 1836
	Zabrini	78.	<i>Amara aenea</i> De Geer, 1774
		79.	<i>Amara ovata</i> Fabricius, 1792
		80.	<i>Amara similata</i> Gyllenhal, 1810

		81.	<i>Zabrus morio</i> Mandrias, 1832
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Table 1. Taxonomic composition of ground beetles of the Zerafshan Range

The most representative in terms of the number of species is the subfamily Harpalinae, which includes 45 species (55.6% of the total species diversity). In terms of the number of individuals, the subfamily Harpalinae accounts for 79.3% of all collected ground beetles. Among the representatives of this subfamily, the tribe Harpalini has the largest number of species, which is represented by 17 species from 11 genera. Among them, *Acinopus laevigatus*, *Eocaraterus chodshenticus*, *Harpalus rufipes* and *Harpalus griseus* are numerous.

The tribe Sphodrini is represented by six species from four genera, the most numerous of which are *Calathus ambiguus* and *Pseudotaphoxenus juvenicus*. The tribe Pterostichini is represented by five species from two genera (*Pterostichus niger* and four species from the genus *Poecilus*).

Six species from the tribe Chlaeniini belonging to the genus *Chlaenius* were identified. The most common are *Chlaenius extensus*. The tribe Lebiini is represented by five species and the tribe Zabryni by four species (three species from the genus *Amara* and one species from the genus *Zabrus*). *Amara aenea* and *Zabrus morio* are the dominant species of carabid fauna.

In the Karabidocomplex of the Zerafshan Range, 15 species belonging to three tribes and five genera are found from the subfamily Trechinae. The tribe Trechini is represented by a single species, *Trechus quadristriatus*, and the tribe Tachyini by three species. The tribe Bembidiini includes 11 species (genus *Asaphidion* - one species, genus *Bembidion* - ten species). Although these species are widespread and numerous in agrolandscapes, their abundance in the studied ridge is low. In general, representatives of the subfamily Trechinae account for 10.46% of all ground beetles and 18.5% of the total species diversity.

Five species of beetles from the subfamily Scaritinae belonging to the genera *Scarites* (four species) and *Clivina* (one species) were identified. The subfamilies Carabinae and Brachininae are represented by four species each (the genus *Carabus* and *Calosoma* each have two species, three species from the genus *Brachinus* and one species from the genus *Mastax*). The subfamily Broscinae is represented by three species from the genera *Broscus* and *Craspedonotus*.

In the complex of ground beetles of the studied territories, two representatives each have the subfamilies Nebriinae and Cicindelinae, and the only species is the subfamily Omophroninae.

The dominant species of the carabid fauna of the Zerafshan Range are *Anchomenus dorsalis* (10.46%), *Calathus ambiguus* (8.23%), *Amara aenea* (7.48%), *Harpalus rufipes* (6.03%). The habitats of subdominant species are rich in *Zabrus morio* (4.77%), *Eocaraterus chodshenticus* (4.54%), *Pseudotaphoxenus juvenicus* (4.47%), and *Harpalus griseus* (4.36%).

Very few are *Brachinus bayardi*, *Broscus punctatus*, *Chlaenius circumscriptus*, *Chlaenius tenuilimbatus*, *Chilotomus usgentensis*, *Craspedonotus margellanicus*, *Ditomus calydonius*, *Notiophilus sublaevis* and *Taphoxenus goliath*, whose dominance is less than 0.1% (Table 2).

№	Species name	Chakil- kalyan	Karatepa	Zirabulak- Ziadin	Total	Degree of dominance, %
1.	<i>Acinopus laevigatus</i>	32	53	16	101	3.76
2.	<i>Acinopus striolatus</i>	12	6	4	22	0.82
3.	<i>Acupalpus parvulus</i>	3	2	-	5	0.19
4.	<i>Agonum viridicupreum</i>	-	4	2	6	0.22

5.	<i>Amara aenea</i>	65	112	24	201	7.48
6.	<i>Amara ovata</i>	1	4	2	7	0.26
7.	<i>Amara similata</i>	2	4	6	12	0.45
8.	<i>Anchomenus dorsalis</i>	94	119	68	281	10.46
9.	<i>Anisodactylus binotatus</i>	-	4	-	4	0.15
10.	<i>Asaphidion flavicorne</i>	9	12	9	30	1.12
11.	<i>Bembidion abbreviatum</i>	3	2	1	6	0.22
12.	<i>Bembidion alnum</i>	5	3	2	10	0.37
13.	<i>Bembidion insidiosum</i>	6	4	-	10	0.37
14.	<i>Bembidion lampros</i>	7	5	-	12	0.45
15.	<i>Bembidion luridicorne</i>	13	9	9	31	1.15
16.	<i>Bembidion piceocyaneum</i>	2	2	1	5	0.19
17.	<i>Bembidion quadrimaculatum</i>	6	7	5	18	0.67
18.	<i>Bembidion quadripustulatum</i>	2	3	1	6	0.22
19.	<i>Bembidion saxatile flavipalpe</i>	12	7	2	21	0.78
20.	<i>Bembidion kirgisorum</i>	3	1	2	6	0.22
21.	<i>Brachinus brevicollis</i>	8	10	12	30	1.12
22.	<i>Brachinus explodens</i>	19	38	12	69	2.57
23.	<i>Brachinus bayardi</i>	2	-	-	2	0.07
24.	<i>Broscus asiaticus</i>	15	6	3	24	0.89
25.	<i>Broscus punctatus</i>	1	1	-	2	0.07
26.	<i>Calathus ambiguus</i>	121	60	40	221	8.23
27.	<i>Calathus melanocephalus</i>	7	11	4	22	0.82
28.	<i>Calathus peltatus</i>	14	12	8	34	1.27
29.	<i>Calosoma auropunctatum</i>	5	7	-	12	0.45
30.	<i>Calosoma sycophanta</i>	2	2	-	4	0.15
31.	<i>Carabus fedtschenkoi</i>	9	11	-	20	0.74
32.	<i>Carabus staudingeri</i>	1	3	-	4	0.15
33.	<i>Carenochyris titanus</i>	4	2	2	8	0.30
34.	<i>Chilotomus usgentensis</i>	-	2	-	2	0.07
35.	<i>Chlaenius</i>	4	2	2	8	0.30

	<i>festivus</i>					
36.	<i>Chlaenius circumscriptus</i>	-	2	-	2	0.07
37.	<i>Chlaenius flavicornis</i>	12	7	5	24	0.89
38.	<i>Chlaenius semicyaneus</i>	1	2	-	3	0.11
39.	<i>Chlaenius tenuilimbatus</i>	1	1	-	2	0.07
40.	<i>Chlaenius extensus</i>	29	10	21	60	2.23
41.	<i>Cicindela turkestanica</i>	9	10	7	26	0.97
42.	<i>Cicindela fischeri</i>	-	4	-	4	0.15
43.	<i>Clivina collaris</i>	8	9	3	20	0.74
44.	<i>Craspedonotus margellanicus</i>	-	1	-	1	0.04
45.	<i>Cymindis quadrisignata</i>	9	17	26	52	1.94
46.	<i>Cymindis andreae</i>	3	4	3	10	0.37
47.	<i>Ditomus calydonius</i>	-	-	2	2	0.07
48.	<i>Dixus eremita</i>	15	19	8	42	1.56
49.	<i>Dixus semicylindricus</i>	3	3	-	6	0.22
50.	<i>Dolichus halensis</i>	11	9	9	29	1.08
51.	<i>Eocaraterus chodshenticus</i>	37	54	31	122	4.54
52.	<i>Harpalus distinguendus</i>	14	13	23	50	1.86
53.	<i>Harpalus griseus</i>	42	21	54	117	4.36
54.	<i>Harpalus rufipes</i>	40	64	58	162	6.03
55.	<i>Harpalus rubripes</i>	11	10	4	25	0.93
56.	<i>Harpalus tenebrosus</i>	3	-	-	3	0.11
57.	<i>Lebia cyonocephala</i>	6	14	-	20	0.74
58.	<i>Lebia scapularis</i>	-	8	-	8	0.30
59.	<i>Lebia festiva</i>	3	-	-	3	0.11
60.	<i>Mastax thermarum</i>	-	2	2	4	0.15
61.	<i>Nebria psammophila</i>	5	3	-	8	0.30
62.	<i>Notiophilus sublaevis</i>	2	-	-	2	0.07
63.	<i>Omophron rotundatum</i>	-	-	3	3	0.11
64.	<i>Parophonus hirsutulus</i>	-	5	3	8	0.30
65.	<i>Poecilus cupreus</i>	7	7	6	20	0.74
66.	<i>Poecilus</i>	14	16	10	40	1.49

	<i>liosomus</i>					
67.	<i>Poecilus longiventris</i>	14	17	11	42	1.56
68.	<i>Poecilus sp.</i>	4	8	1	13	0.48
69.	<i>Pseudotaphoxenus juvenicus</i>	44	58	18	120	4.47
70.	<i>Pterostichus niger</i>	17	12	11	40	1.49
71.	<i>Scarites basiplicatus</i>	4	8	-	12	0.45
72.	<i>Scarites procerus</i>	-	-	11	11	0.41
73.	<i>Scarites subcylindricus</i>	-	3	-	3	0.11
74.	<i>Scarites terricola</i>	6	3	4	13	0.48
75.	<i>Stenolophus abdominalis</i>	22	17	3	42	1.56
76.	<i>Tachys turkestanicus</i>	4	3	5	12	0.45
77.	<i>Tachyura euphratica</i>	-	3	1	4	0.15
78.	<i>Tachyura tetraspila</i>	4	4	-	8	0.30
79.	<i>Taphoxenus goliath</i>	-	2	-	2	0.07
80.	<i>Trechus quadristriatus</i>	35	21	46	102	3.80
81.	<i>Zabrus morio</i>	45	59	24	128	4.77
Number of individuals		973	1063	650	2686	100.00
Number of species		66	74	54	81	-
Species richness, DMg		9.45	10.47	8.18	10.13	-
Species richness, DMn		2.12	2.27	2.12	1.56	-
Diversity indicator Shannon, H		3.54	3.55	3.39	3.60	-
Shannon equitability index, EH		0.84	0.83	0.85	0.82	-
Simpson's Diversity Index, D (Sλ)		0.045	0.046	0.047	0.043	-
Berger - Parker dominance index, d		0.124	0.112	0.10	0.105	-

Table 2. Diversity and abundance of Carabidae in three mountains of the Zeravshan Range

As noted above, the Zeravshan Range is divided into the Chakilkalyan, Karatepa, Zirabulak and Ziadin mountains. The greatest diversity of ground beetles was noted on the Karatepa mountains (74 species), and the least on the Zirabulak and Ziadin mountains (54 species). The Chakilkalyan mountains occupies an intermediate position (66 species). However, there were no significant differences in the indices of ecological diversity of the beetle fauna in these territories (Table 2).

An analysis of the similarity of the fauna of the studied territories shows that the fauna of the ground beetles of the Chakalikalyan and Karatepa mountains are closer to each other (Jaccard index - 0.79, Chekanovsky-Sørensen coefficient - 0.89) (Table 3). The lowest value of the similarity coefficients was noted between the Chakalikalyan and Zirabulak-Ziadin mountains (0.64; 0.78).

Mountains	Karatepa	Chakilkalyan	Zirabulak-Ziadin
Karatepa	-	0.89	0.8
Chakilkalyan	0.79	-	0.78
Zirabulak-Ziadin	0.66	0.64	-

Table 3. Similarity of species composition of Carabidae in three areas of the Zeravshan Range (Jaccard / Chekanovsky-Sørensen indices)

The species *Ditomus calydonius*, *Omophron rotundatum* and *Scarites procerus* are unique for the Zirabulok-Ziyadin Mountains and are found only in this part of the Zeravshan Range. Eight species of ground beetles were found only in the Karatepa Mountains (*Anisodactylus binotatus*, *Chilotomus usgentensis*, *Chlaenius circumscriptus*, *Cicindela fischeri*, *Craspedonotus margellanicus*, *Lebia scapularis*, *Scarites subcylindricus* and *Taphoxenus goliath*). *Brachinus bayardi*, *Harpalus tenebrosus*, *Lebia festiva* and *Notiophilus sublaevis* were found only in the Chakalikalyan Mountains.

In these three areas of the Zeravshan Range, the degree of dominance of individual species can vary significantly. Thus, *Calathus ambiguus* (12.44%) is the most numerous in the Chakalikalyan Mountains. The habitats of dominant species are also *Anchomenus dorsalis* (9.66%) and *Amara aenea* (6.68%). Subdominants also have a high degree of dominance: *Zabrus morio* (4.62%), *Pseudotaphoxenus juvencus* (4.52%), *Harpalus griseus* (4.32%) and *Harpalus rufipes* (4.11%).

In the Karatepa Mountains, the dominant species are located in the following order: *Anchomenus dorsalis* (11.19%), *Amara aenea* (10.54%), *Harpalus rufipes* (6.02%), *Calathus ambiguus* (5.64%), *Zabrus morio* (5.55%), *Pseudotaphoxenus juvencus* (5.46%), *Eocaraterus chodshenticus* (5.08%) and *Acinopus laevigatus* (4.99%). Thus, *Eocaraterus chodshenticus* and *Acinopus laevigatus* join the dominant species, and *Harpalus rufipes* is excluded from the dominant species.

And on the Zirabulak-Ziadin mountains, the dominant species are located in the following order: *Anchomenus dorsalis* (10.46%), *Harpalus rufipes* (8.92%), *Harpalus griseus* (8.31%), *Trechus quadristriatus* (7.08%), *Calathus ambiguus* (6.15%), *Eocaraterus chodshenticus* (4.77%) and *Cymindis quadrisignata* (4.0%). Here, there are no dominant species of *Zabrus morio* and *Pseudotaphoxenus juvencus*, but *Trechus quadristriatus* and *Cymindis quadrisignata* appear among the dominant species. However, in this section of the Zeravshan Range, the number of ground beetles, which are widely distributed in the agricultural landscapes *Harpalus rufipes*, *Harpalus griseus* and *Trechus quadristriatus*, is increasing.

The number of dominant species can vary significantly at different points within the same mountain, depending on the height of the area. So, as the height of the area increases, the abundance of *Pseudotaphoxenus juvencus* and *Eocaraterus chodshenticus* increases, while the other dominant species show an opposite trend, that is, as the height increases, a decrease in abundance is observed. It should be noted that altitudinal belts affect not only the diversity and abundance of ground beetles, but also the morphometric features of individual species (Zokirova and Khalimov 2022).

Conclusion

For the first time, a list of ground beetles of the Zeravshan Range was compiled, including 81 species. A comparative analysis of the ecological diversity of the carabid fauna of the Chakaliyan, Karatepa and Zirabulak mountains, which are part of the ridge, was carried out. Dominant and rare species were identified. Among rare beetle species in need of protection are *Brachinus bayardi*, *Broscus punctatus*, *Chlaenius circumscriptus*, *Chlaenius tenuilimbatus*, *Chilotomus usgentensis*, *Craspedonotus margellanicus*, *Ditomus calydonius*, *Notiophilus sublaevis* and *Taphoxenus goliath*. However, further research is required to fully understand the state of the populations of these species.

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