Acta Biologica Sibirica
Vol 10 (2024): Acta Biologica Sibirica, 409–439
Articles

Faunistical and ecological analysis of digger wasps (Hymenoptera: Sphecidae, Crabronidae) in Uzbekistan

Makhsetbay Zh. Medetov	Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, 232 Bogishamol st., Tashkent, 100053, Uzbekistan
Muratbay A. Embergenov	Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, 232 Bogishamol st., Tashkent, 100053, Uzbekistan
Bakhtiyor R. Kholmatov	Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, 232 Bogishamol st., Tashkent, 100053, Uzbekistan
Muhayyo V. Elmurodova	National University of Uzbekistan named after Mirzo Ulugbek, 4 University st.,Tashkent, 100174, Uzbekistan
Matnazar Sh. Rakhimov	National University of Uzbekistan named after Mirzo Ulugbek, 4 University st.,Tashkent, 100174, Uzbekistan
Juldizkhan D. Tajibaeva	Karakalpak State University named after Berdakh, 1 Abdirov st., Nukus, 742012, Uzbekistan

This article presents the results of scientific research conducted in 2021–2023 on the study of digger wasps belonging to the Sphecidae, Crabronidae family in different regions of Uzbekistan, as well as the results of the study of literature sources. Total 484 species of which 69 species belonging to Sphecidae family, 415 species to Crabronidae family, 21 tribes and 74 genera were recorded in our republic. In terms of subspecies, Crabroninae equals to 24.8%, Bembicinae 18.2%, Philanthinae 17.8 %, Eremiaspheciinae 15.7 %, Ammophilinae 7.2 %, Pemphredoninae 6.6 %, Sphecinae 5.2 %, Astatinae 2.1%, Sceliphrinae 1.8 % and Dinetinae 0.6 %. 125 species were identified in the North-Western region of Uzbekistan, 253 species in the North-Eastern region, 66 species in the Eastern region, 261 species in the Central region, and 101 species in the Southern region. The digger wasp species in the North-Western and Central regions of Uzbekistan have the closest similarity of 30%, and the Eastern and Southern regions have the furthest similarity. 48% of digger wasps are native to desert, 35% to mountain and lowlands and least agrocenosis landscapes.

Acta Biologica Sibirica 10: 409–439 (2024) doi: 10.5281/zenodo.11195851

Corresponding author: Muratbay A. Embergenov (embergenov.m.a@inbox.ru)

Academic editor: R. Yakovlev | Received 11 October 2023 | Accepted 25 January 2024 | Published 17 May 2024

http://zoobank.org/9A975F5A-B5A3-4400-9ABA-C3DE3432F615

Citation: Medetov MZh, Embergenov MA, Kholmatov BR, Elmurodova MV, Rakhimov MSh, Tajibaeva JD (2024) Faunistical and ecological analysis of digger wasps (Hymenoptera: Sphecidae, Crabronidae) in Uzbekistan. Acta Biologica Sibirica 10: 409–439. https://doi.org/10.5281/zenodo.11195851

Keywords

Sphecidae, Crabronidae, digger wasps, insect net, Uzbekistan, North-West, North-East, East, Central, South

Introduction

Digger wasps are found almost everywhere except the Arctic and Antarctic. All digger wasps were considered as a single family Sphecidae for a long time. Currently, these are divided into 4 families (Ampulicidae, Heterogynaidae, Crabronidae and Sphecidae) (Melo 1999). Digger wasps are among the most widespread families of Hymenopteras, and 9936 species (807 species of the Sphecidae family, 9129 species of the Crabronidae family) are known worldwide (Pulawski 2023).

The study of the first faunistic analysis and systematics in Central Asia was associated with the works by F.F. Morawitz, A.P. Fedchenko, O.I. Radoszkowski (Kazenas, 2002). O.I. Radoszkowski (1877) analyzed the materials found by A.P. Fedchenko during his expedition in the Turkestan region in 1869–1871, and identified 3 new genera and 70 new species from the North-Eastern, Eastern and Central regions of Tajikistan, Kyrgyzstan, Kazakhstan and Uzbekistan.

To date, digger wasps have been cited in several works on faunistic analysis in Uzbekistan, including O. Radoszkowski (1871, 1872, 1877, 1888), F.F. Kohl (1888, 1891, 1906), A.V. Shestakov, (1917, 1918, 1923), V.G. Marshakov, (1973, 1976), A.G. Davletshina, G.A. Avenesova, A.K. Mansurov (1979), V.V. Gussakovskij, (1927, 1928, 1930, 1931, 1933,1935, 1936, 1937, 1952, 1987, 1971, 1973), Sh.D. Islamov, (1983, 1986, 1989), P.G. Nemkov, (1990, 2009, 2012, 2016), A.V. Antropov, (1994), V.L. Kazenas, (1995, 1998, 2002), T.T. Kulumbetova (1999), M.V. Mokrousov (2015, 2016, 2017, 2019, 2020,), W.J. Pulawski, (1965, 1971, 1973, 1983, 1977, 1979), Yu.N. Danilov (2012, 2020 2022), Ch. Schmid-Egger, M. Hauser (2021), and others. In the article by M. Mokrousov published in 2015, it is mentioned that there are about 470 species in Uzbekistan. However, it is not mentioned in which regions these 470 species are distributed. According to our information, there are 484 species in Uzbekistan, of which 69 species belonging to the Sphecidae family and 415 species belonging to the Crabronidae family are widespread. Our goal in this article is to study in detail the faunistic studies of Sphecidae, Crabronidae families in Uzbekistan.

Materials and methods

Our research was conducted in all regions of the Republic of Uzbekistan in 2021– 2023 (Figs 1–2).

Uzbekistan is considered very convenient due to its geographical location. Uzbekistan is located at almost the same geographical latitude as the countries around the Mediterranean Sea. The countries around the Mediterranean Sea are characterized by a subtropical landscape. But due to the fact that Uzbekistan is located inland, away from warm oceans and seas, its natural conditions are completely different from the countries around the Mediterranean Sea. Because the northern part of the territory of Uzbekistan is open, the cold, dry air stream blowing from the north and northeast easily reaches the inner parts in winter. On the contrary, the presence of high mountains from the south prevents the passage of moist and warm air masses blowing from the Indian Ocean to the territory of Uzbekistan. As a result, a non-subtropical landscape was created in Uzbekistan, summer is cloudless, dry, hot and scorching, and winter is cold for this geographical latitude. Therefore, although Uzbekistan is located in the subtropical climate region, it is characterized by a landscape typical of the desert. Only the Surkhan-Sherabad valley, which is surrounded by mountains, has a dry subtropical landscape. Uzbekistan is located in the central part of Turkestan. The main part of the territory lies between the Amudarya and Syrdarya rivers and is located in the temperate and subtropical climate regions. The northernmost point of Uzbekistan is in the northeast of the Ustyurt plateau, on the coast of the Aral Sea, at 45^0 31^0 north latitudes. The southernmost point is near the city of Termiz, on the banks of Amudarya, and corresponds to 337^0 11^0 north latitude. The westernmost point of our republic is 56^0 00^0 east on the Ustyurt plateau, the easternmost point is on the border of Uzbekistan and Kyrgyzstan, near the city of Ozgan, and is

370^0 100^0 east. The distance between the northernmost point and the southernmost point of Uzbekistan is 935 km, and the distance between the westernmost point and the easternmost point is 1400 km. Various tools and methods were employed in gathering materials, such as the utilization of entomological insect nets, including the traditional method, alongside specific traps like Malaise and Yellow pan traps. Additionally, tools like tweezers and a camera were used, along with diverse locations such as bushes, tree branches, residential areas, farm buildings, and Moericke's plastic containers designed for trapping insects. Golub (2012) and Moericke (1951) were referenced sources during the collection process. The collected materials were stored in plastic containers at a concentration of 96% alcohol. MBS-9 and SMZ-161-TL binocular microscopes were also used. Species were identified using reference sources (Kazenas, 1978, 1984, 1998, Nemkov, 2016c, etc.). The coordinates+ of the material collection sites were determined using maps.me and Google Earth. In order to compare the species of digger wasps in the regional section, the degree of similarity of species in the fauna was determined using the P. Jaccard similarity coefficient, and cluster analysis was performed (Chao 2005).

$K_j = c / a+b+c$

Here,

K_j – similarity coefficient of Jaccard;

c – the number of similar species;

a and b – the total number of species in the compared faunas.

The materials stored in the collection of the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan were analyzed. All literature on digger wasps was reviewed. Specimens Specimens were collected from the North-West, North-East, East, Central and South geographical regions of Uzbekistan in all seasons of 2021–2023.

Figure 1. *Regions of Uzbekistan where specimens specimens were collected (a – Kyzylkum, b – Lower Amudarya State Biosphere Reserve, c – Nurata Natural Reserve, d – Kitob district, agrocenosis).*

Result and discussion

Research of the fauna of digger wasps (Sphecidae, Crabronidae) of Uzbekistan has been carried out for almost 90 years and more than 1456 specimens specimens from five North-West, North-East, East, Central and South geographical regions of Uzbekistan were collected using various methods during 2021–2023 (Figs 3–5) and more than 231 biomaterials in the collection of the Zoological Institute of the Republic of Uzbekistan were analyzed. Of the total analyzed 1456 samples, 700 specimens were collected in 2021, 900 specimens in 2022 and 400 specimens in 2023. When we study them in the cross sections of seasons, they estimate 48% in spring (699), 40% in summer (578), and 12% in autumn (175). When we divide the total of 1687 collected and analyzed specimens by the regions of Uzbekistan, there are 639 specimens in the North-Western area, 196 in the North-Eastern area, 71 in the Eastern area, 720 in the Central area, and 61 in the Southern area. As for landscapes, 802 (48%) specimens were collected from the desert landscape, 572 (35%)

from the mountain and lowland landscapes, and 283 (17%) from the agrolandscapes (Fig.3).

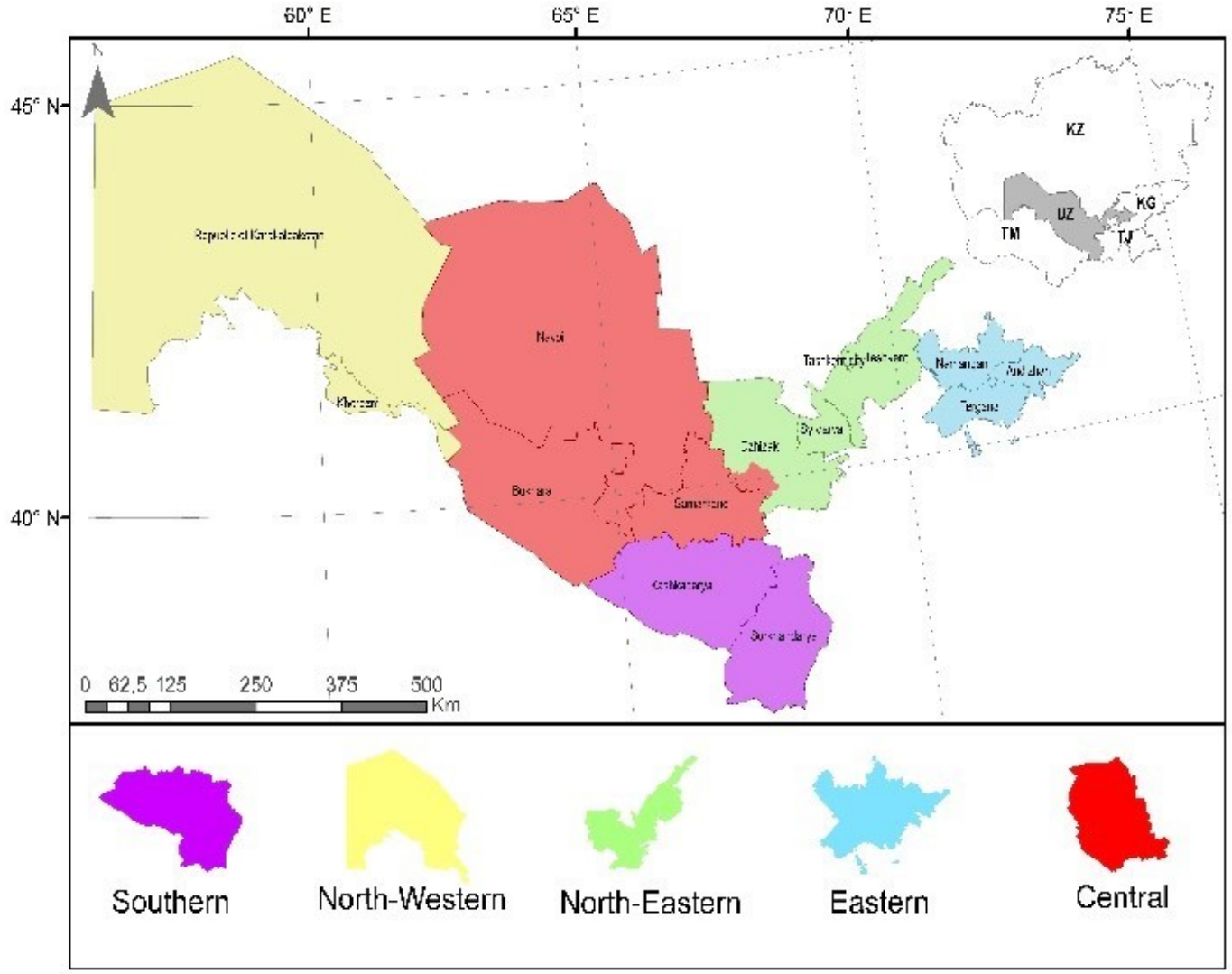

Figure 2. *Distribution in the geographical areas of Uzbekistan.*

More than 1250 specimens were collected by Insect net, about 500 by Malaise trap and more than 200 by Yellow pan trap (Figs 4–6).

Researchers gathered 32 samples of specimens from the Kyzylkum desert by employing the Insect net method on May 10, 2022. Collection took place during two periods: from 9^{00} to 12^{00} in the morning and again from 15^{00} to 18^{00} in the evening. (Table 1). When the collected specimens were identified, 13 digger wasps were found, of which the most species belong to *Stizus ruficornis* species – 4 specimens (12.5%), and the least species belong to *Oxybelus kizilkumii*, *Philanthus venustus* – 1 speciemen (3.1%).

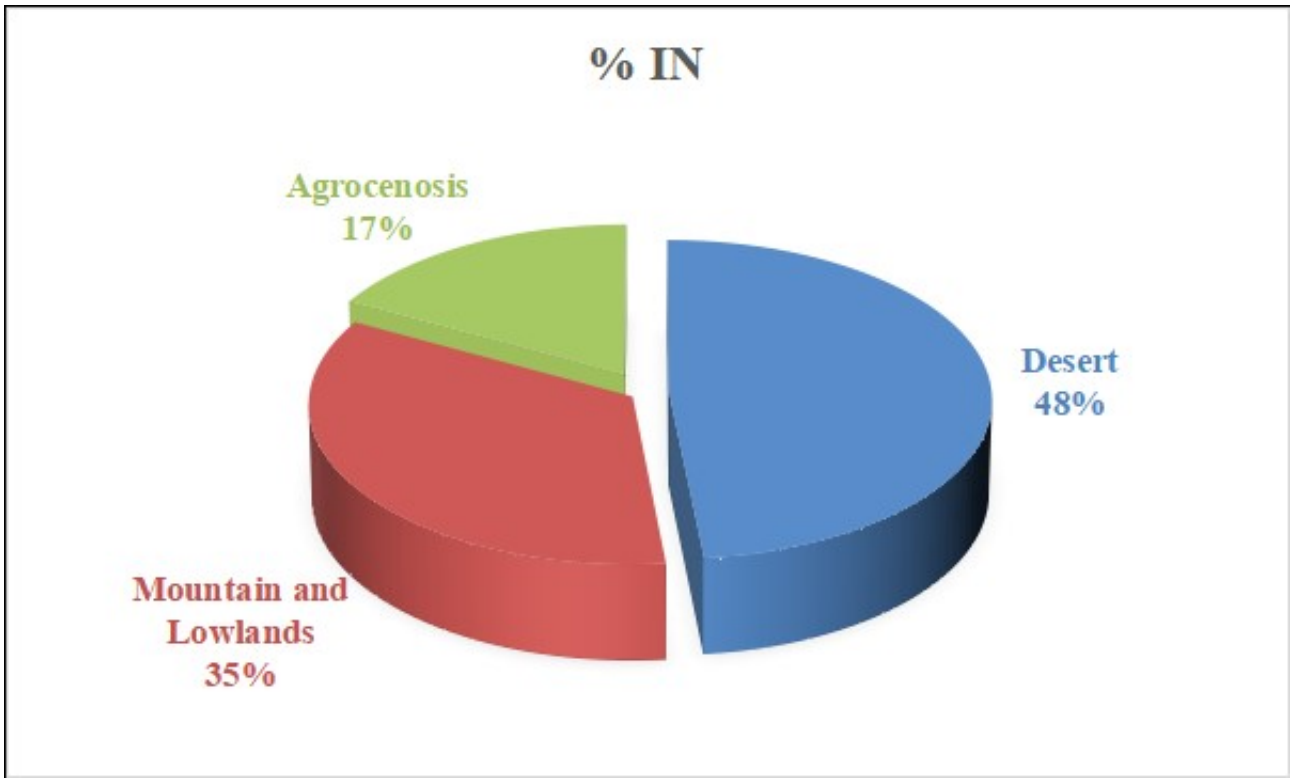

Figure 3. *Distribution of digger wasps (Sphecidae, Crabronidae) in Uzbekistan by landscapes.*

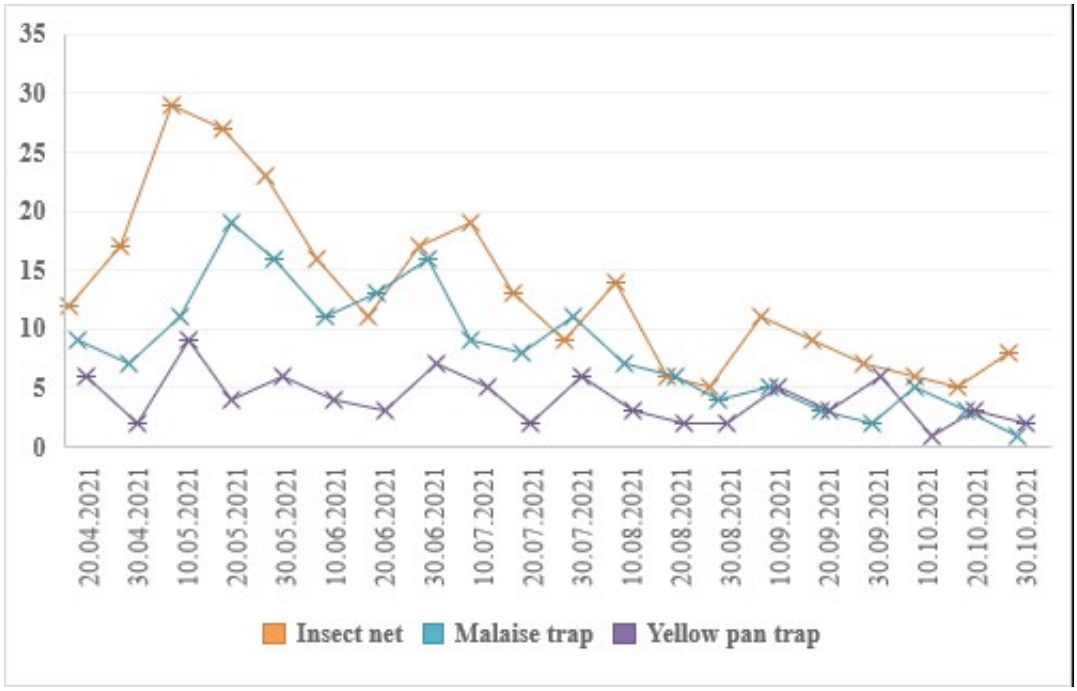

Figure 4. *The number of specimens of digger wasps collected from entomological Insect net in 2021.*

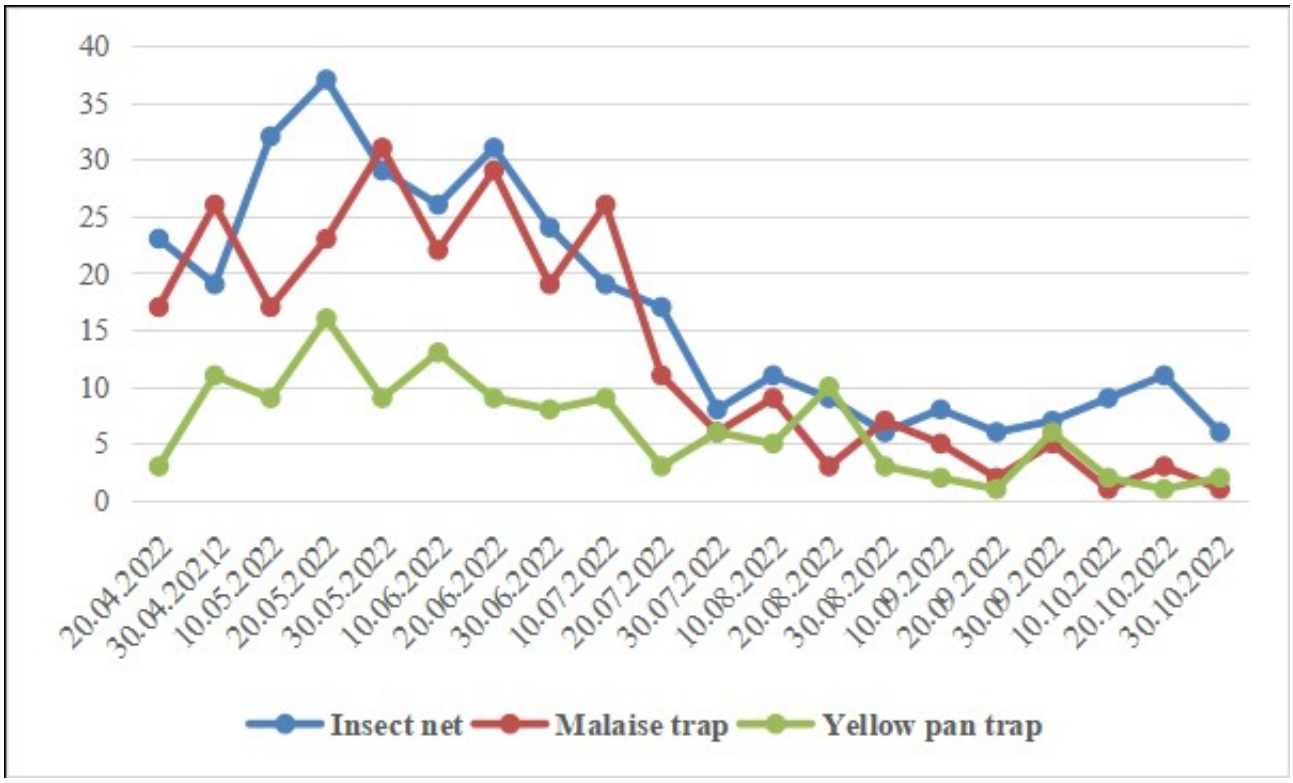

Figure 5. *The number of specimens of digger wasps collected from entomological traps in 2022.*

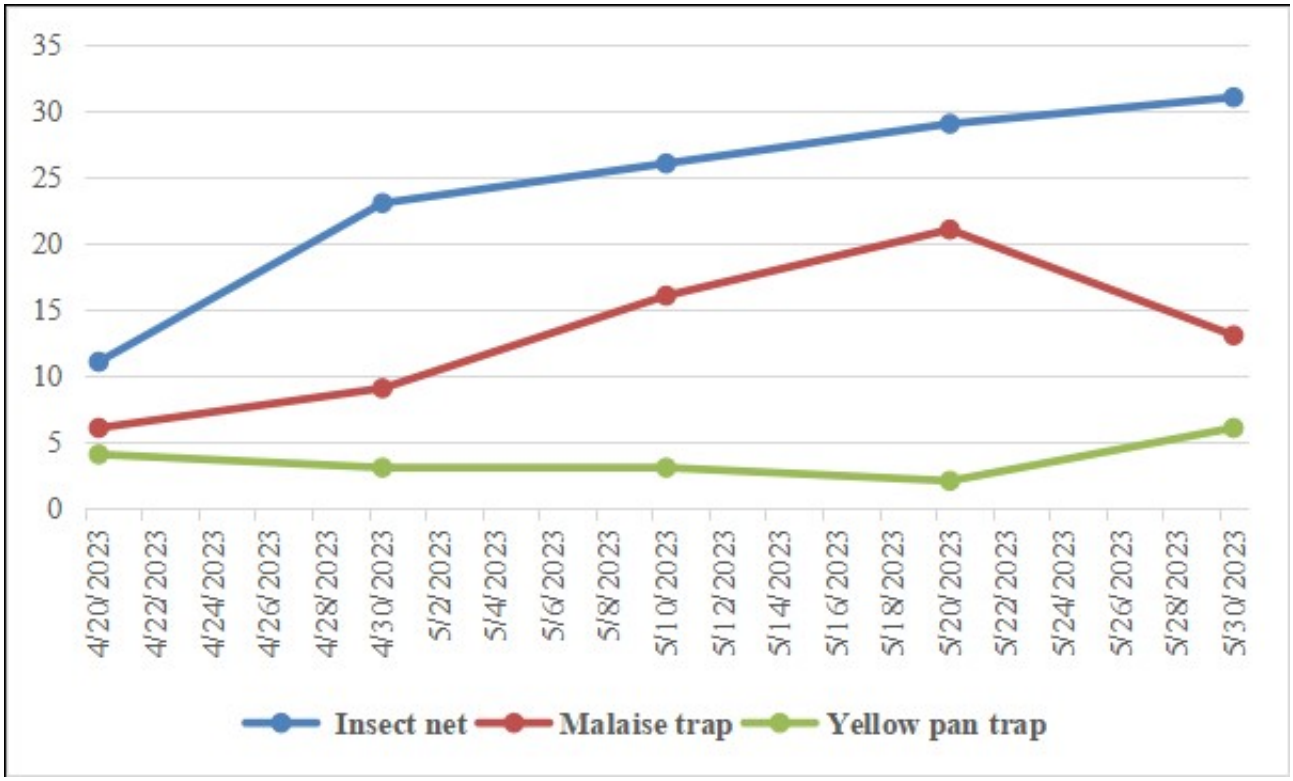

Figure 6. *The number of specimens of digger wasps collected from entomological traps in 2023.*

On May 10, 2022, 32 specimens were collected in our study from the Kyzylkum desert using the insect net method (Table 1).

On May 20, 2022, when we analyzed the biomaterials collected by the Malaise trap in the new green covers established on the dry bottom of the Aral Sea, 19 specimens of digger wasps made up 7 species. It was found that 6 specimens of *Ammophila heydeni* were collected and made up 31.6%, while 1 specimen was collected from *Pemphredon tridentata* and *Stizus perrisii* species and it was estimated to be 5.3% each.

Using the Malaise method, researchers gathered 19 specimens on May 20, 2022, in Aralkum (Table 2).

No	Species	Number of specimens	%
1	*Palmodes melanarius* (Mocsáry, 1883)	2	6.2
2	*Sphex funerarius* Gussakovskij, 1934	2	6.2
3	*Ammophila heydeni* Dahlbom, 1845	3	9.4
4	*Ammophila sabulosa* (Linnaeus, 1758)	3	9.4
5	*Podalonia tydei* (Le Guillou, 1841)	2	6.2
6	*Oxybelus kizilkumii* Radoszkowski, 1877	1	3.1
7	*Bembix oculata* Panzer, 1801	3	9.4
8	*Stizus ruficornis* (J. Forster, 1771)	4	12.5
9	*Stizus rufiventris* Radoszkowski, 1877	3	9.4
10	*Bembecinus tridens* (Fabricius, 1781)	2	6.2
11	*Philanthus desertorum* F. Morawitz, 1890	3	9.4
12	*Philanthus venustus* (Rossi, 1790)	1	3.1
13	*Cerceris deserticola* F. Morawitz, 1890	3	9.4

Table 1. *Species collected from Kyzylkum desert on May 10, 2022 using the Insect net method*

No	Species	Number of specimens	%
1	*Ammophila campestris* Latreille, 1809	4	21
2	*Ammophila elongata* Fischer de Waldheim, 1843	2	10.5
3	*Ammophila heydeni* Dahlbom, 1845	6	31.6
4	*Pemphredon tridentata* Gussakovskij, 1952	1	5.3
5	*Stizus koenigi* F.Morawitz, 1888	2	10.5
6	*Stizus perrisii* Dufour, 1838	1	5.3
7	*Philanthus triangulum* (Fabricius, 1775)	3	15.8

Table 2. *Species collected by Malaise method in Aralkum on 20 May 2022*

As a result of the analysis of the obtained results, total 484 species of which 69 species belonging to Sphecidae family, 415 species to Crabronidae family, 21 tribes and 74 genera were recorded in Republic. Of these 484 identified species, 142 species were identified during our research, and 342

species were identified as a result of literature analysis (Table 3).

The research results indicate that 74% of digger wasp species belonging to Sphecidae and Crabronidae are listed by two or more authors.

No	Species	North- Western	North- Eastern	Eastern	Central	Southern
	Sphecidae					
1	*Chalybion walteri* (Kohl, 1889)	-	+	-	-	-
2	*Chalybion femoratum* (Fabricius, 1781)	-	+++	-	-	+
3	*Chalybion turanicum* (Gussakovskij, 1935)	+++	+++	-	+++	+++
4	*Chlorion regale* (F. Smith, 1873)	-	+	-	-	-
5	*Sceliphron curvatum* (F. Smith, 1870)	-	-	-	+	-
6	*Sceliphron deforme* (F. Smith, 1856)	-	+++	-	+++	-
7	*Sceliphron destillatorium* (Illiger, 1807)	++	+++	++	+++	-
8	*Sceliphron madraspatanum* (Fabricius, 1781)	++	+++	++	+++	+++
9	*Sceliphron shestakovi* Gussakovskij, 1928	-	+++	-	+++	-
10	*Palmodes hissaricus* Danilov, 2020	-	-	-	+	-
11	*Palmodes mela narius* (Mocsáry, 1883)	++	+	++	+++	+++
12	*Palmodes minor* (F. Morawitz, 1890)	-	-	++	-	+++
13	*Palmodes occitanicus* (Lepeletier de Saint Fargeau et Audinet-Serville, 1828)	-	+	-	++	+
14	*Palmodes orient alis* (Mocsáry, 1883)	++	-	+	+++	-
15	*Palmodes strigulosus* (A. Costa, 1861)	-	+	-	-	-
16	*Prionyx crudelis*	-	-	-	+	-

	(F.Smith, 1856)					
17	*Prionyx haberhaueri* (Radoszkowski, 1871)	-	+	-	+++	-
18	*Prionyx kirbii* (Vander Linden, 1827)	++	+	-	++	-
19	*Prionyx lividocinctus* (A. Costa, 1861)	++	+	-	++	+
20	*Prionyx macula* (Kohl, 1889)	-	-	-	+	-
21	*Prionyx nigropectinatus* (Taschenberg, 1869)	-	-	-	+	-
22	*Prionyx niveatus* (Dufour, 1854)	++	+	-	+++	-
23	*Prionyx nudatus* (Kohl, 1885)	++	+	-	++	+++
24	*Prionyx radoszkowskyi* (Kohl, 1888)	+++	+	-	-	-
25	*Prionyx sirdariensis* (Radoszkowski, 1877)	-	+	-	-	-
26	*Prionyx songaricus* (Eversmann, 1849)	-	-	-	-	+
27	*Prionyx stschurowskii* (Radoszkowski, 1877)	-	+	-	-	-
28	*Prionyx subfuscatus* Dahlbom, 1845	-	+	-	+++	-
29	*Prionyx viduatus* (Christ, 1791)	++	+	-	++	-
30	*Sphex flavipennis* Fabricius, 1793	-	+	-	++	+
31	*Sphex funerarius* Gussakovskij, 1934	++	+	-	+++	+++
32	*Sphex leuconotus* Brullé, 1833	-	++	++	++	+
33	*Sphex oxianus* Gussakovskij, 1928	+	-	+	-	-
34	*Sphex pruinosus*	-	+	-	-	+

	Germar, 1817					
35	*Ammophila adelpha* Kohl, 1901	-	-	+	+++	-
36	*Ammophila altigena* Gussakovskij, 1930	-	-	+	-	-
37	*Ammophila camp estris* Latreille, 1809	+++	+	-	+++	+
38	*Ammophila dentigera* Gussakovskij, 1928	+	-	-	-	-
39	*Ammophila elongata* Fischer de Waldheim, 1843	+++	-	-	+	-
40	*Ammophila gracill ima* Taschenberg, 1896	++	+++	-	-	+
41	*Ammophila heydeni* Dahlbom, 1845	++	+	-	+++	+
42	*Ammophila hungarica* Mocsáry, 1883	-	+	-	-	+
43	*Ammophila induta* Kohl, 1901	-	-	-	+	-
44	*Ammophila lativalv is* Gussakovskij, 1928	+	-	-	-	-
45	*Ammophila meridionalis* Kazenas, 1980	-	-	-	-	+
46	*Ammophila mongolensis* Tsuneki, 1971	-	+	-	-	+
47	*Ammophila nemkovi* Danilov, 2018	-	-	-	-	+
48	*Ammophila occipitalis* F. Morawitz, 1890	++	-	-	+	-
49	*Ammophila kohli* Dollfuss, 2013	-	-	-	+	-
50	*Ammophila pr oduc ticollis* Morice, 1900	-	-	-	+	-
51	*Ammophila sabulosa* (Linnaeus, 1758)	++	+	-	+++	+
52	*Ammophila sarekandana*	-	-	-	-	+

	Balthasar, 1957					
53	*Ammophila tekkensis* Gussakovskij, 1930	+	-	-	-	-
54	*Ammophila terminata* F. Smith, 1856	++	-	-	+++	-
55	*Ammophila turkestana* Kohl, 1906	+	-	-	+	-
56	*Podalonia affinis* (W. Kirby, 1798)	++	+++	-	++	-
57	*Podalonia alpina* (Kohl, 1888)	-	+	-	-	-
58	*Podalonia cauca sica* (Mocsáry, 1883)	-	+	-	-	-
59	*Podalonia ebenina* (Spinola, 1839)	++	-	-	-	+
60	*Podalonia fera* (Lepeletier de Saint Fargeau, 1845)	-	+	-	-	-
61	*Podalonia hirsuta* (Scopoli, 1763)	++	+	++	+++	-
62	*Podalonia luffii* (E. Saunders, 1903)	-	+++	-	++	-
63	*Podalonia nigrohirta* (Kohl, 1888)	-	-	-	+	+
64	*Podalonia tydei* (Le Guillou, 1841)	+++	-	-	+	+
65	*Parapsammophil a turanica* (F. Morawitz, 1890)	-	-	-	+	-
66	*Eremochares dives* (Brullé, 1833)	++	-	++	++	+
67	*Eremochares ferghanica* (Gussakovskij, 1930)	-	-	+	-	-
68	*Eremochares mirabil is* (Gussakovskij, 1928)	+	-	-	+	-
69	*Eremochares kohlii* (Gussakovskij, 1928)	-	-	-	+	-
	Crabronidae					
70	*Mimesa caucasica* Maidl, 1914	++	-	-	+	-
71	*Mimesa hissarica* (Gussakovskij,	-	+	-	-	-

	1935)					
72	*Mimesa kazenasi* Budrys, 1985	-	-	-	+	-
73	*Mimesa lutaria* (Fabricius, 1787)	-	+	+	-	-
74	*Mimesa pulawskii* (Kazenas, 1978)	-	-	-	+	-
75	*Mimesa shestakovi* (Gussakovskij, 1937)	-	-	-	+	-
76	*Mimesa nigrita* Eversmann, 1849	-	+	-	++	-
77	*Mimumesa littoralis* (Bondroit, 1934)	-	-	-	+++	-
78	*Mimumesa unicolor* (Vander Linden, 1929)	++	+	+	+++	-
79	*Psen ater* (Olivier, 1792)	-	+	-	-	-
80	*Psenulus laevis* Gussakovskij, 1928	+++	+	+	++	-
81	*Psenulus pallipes* Panzer, 1798	-	+	-	-	+
82	*Diodontus ammobius* Budrys (in lit.)	-	-	-	+	-
83	*Diodontus hyalipennis* Kohl, 1892	-	+	-	++	-
84	*Diodontus minutus* (Fabricius, 1793)	++	+	+	+	+
85	*Diodontus puncticeps* Gussakovskij, 1935	-	+	-	-	-
86	*Diodontus tristis* (Vander Linden, 1829)	-	+	-	-	-
87	*Pemphredon inornata* Say, 1824	-	-	-	++	+
88	*Pemphredon lethifer* (Shuckard, 1837)	+++	+	-	+++	-
89	*Pemphredon*	-	+	-	-	-

	lugubris (Fabricius, 1793)					
90	*Pemphredon tridentata* Gussakovskij, 1952	+++	+	-	++	-
91	*Pemphredon morio* Vander Linden, 1829	-	+	-	-	-
92	*Passaloecus clypealis* Faester, 1947	+	+	-	-	-
93	*Passaloecus gracilis* (Curtis, 1834)	-	+	+	++	-
94	*Passaloecus turanicus* Gussakovskij, 1952	-	+	+	-	-
95	*Spilomena fulvicornis* Gussakovskij, 1931	-	-	-	+	-
96	*Spilomena mocsaryi* Kohl, 1898	-	-	-	-	+
97	*Spilomena troglodytes* (van der Linden, 1829)	-	+	-	-	-
98	*Ammoplanellus chorasmius* (Gussakovskij, 1931)	+	-	-	-	-
99	*Ammoplanus angularis* Gussakovskij, 1952	-	-	-	-	+
100	*Ammoplanus marathroicus* (De Stefani Perez, 1887)	-	-	-	-	+
101	*Ammoplanops carinatus* Gussakovskij, 1931	+	-	-	-	-
102	*Astata boops* (Schrank, 1781)	++	+	-	-	-
103	*Astata costae* A. Costa, 1867	-	+	-	-	-
104	*Astata kashmirensis* Nurse, 1909	++	+	-	++	-
105	*Astata maculata* Radoszkowski, 1877	-	+	-	+	-

106	*Astata minor* Kohl, 1885	++	-	-	+	-
107	*Astata rufipes* Mocsary, 1883	-	-	-	+	-
108	*Dryudella aralens is* Kazenas, 2000	-	-	-	-	+
109	*Dryudella frontali s* Radoszkowski, 1877	-	+	-	-	-
110	*Dryudella tricolor* van der Linden, 1829	++	-	-	+++	-
111	*Dryudella rasnit syni* Kazenas, 2000	-	-	-	-	+
112	*Dinetus p sa mmo philus* Kazenas, 1977	-	-	-	+	-
113	*Dinetus turani cus* Kazenas, 1993	-	-	-	-	+
114	*Dinetus rakhi movi* Mokrousov et Khedher, 2020	-	-	-	-	+
115	*Laphyragogus kohlii* (Bingham, 1896)	-	-	-	+	+
116	*Larra anath ema* (Rossi, 1790)	++	-	++	+++	-
117	*Larra transcaspica* F. Morawitz, 1894	+	-	-	+	-
118	*Liris atrata* (Spinola, 1805)	-	-	+	-	-
119	*Liris nigrica ns* (Walker, 1871)	-	+	-	-	-
120	*Liris niger* (Fabricius, 1775)	++	+	+++	++	+
121	*Larropsis asiatica* (Gussakovskij, 1935)	-	+	-	-	-
122	*Gastrosericus flavic ornis* Gussakovskij, 1931	+	-	-	-	-
123	*Gastrosericus*	+	-	-	-	-

	marginalis Gussakovskij, 1931					
124	*Gastrosericus moricei* Saunders, 1910	-	-	-	-	+
125	*Gastrosericus shest akovi* Gussakovskij, 1931	-	-	-	+	-
126	*Gastrosericus waltlii* Spinola, 1838	+	-	-	+	-
127	*Ancistromma asiatica* Gussakovskij, 1935	-	-	-	+	-
128	*Tachytes alfierii* Pulawski, 1962	-	-	-	+	-
129	*Tachytes argyreus* (F. Smith, 1856)	-	-	-	+	-
130	*Tachytes bidens* Gussakovskij, 1952	+++	-	-	-	-
131	*Tachytes chiven sis* Pulawski, 1962	-	+	-	-	-
132	*Tachytes cornige r* Gussakovskij, 1952	-	-	+	-	-
133	*Tachytes europaeus* Kohl, 1884	-	-	-	-	+
134	*Tachytes famelicus* Pulawski, 1962	-	-	-	+	-
135	*Tachytes frey gessneri* Kohl, 1881	-	-	-	+++	-
136	*Tachytes integer* Gussakovskij, 1932	-	-	-	+	-
137	*Tachytes lanuginosus* Pulawski, 1962	-	-	-	+	-
138	*Tachytes levant inus* Pulawski, 1962	-	-	-	+	-
139	*Tachytes matr onalis* Dahlbom, 1845	-	-	-	+	-
140	*Tachytes obsoletus* Rossi, 1792	++	+	-	+++	-

141	*Tachytes popovi* Pulawski, 1962	-	-	-	+	-
142	*Tachytes tarsalis* (Spinola, 1838)	-	+++	-	+	-
143	*Tachytes vagus* Radoszkowski, 1877	++	+	-	+	-
144	*Tachysphex albo cinctus* (Lucas, 1848)	+	-	-	-	-
145	*Tachysphex angu status* Pulawski, 1967	+	+	-	-	-
146	*Tachysphex arge ntatus* Gussakovskij, 1952	-	-	-	+	-
147	*Tachysphex blattivorus* Gussakovskij, 1952	-	+++	-	+	-
148	*Tachysphex brevipe s* Pulawski, 1971	-	-	+	-	-
149	*Tachysphex consocius* Kohl, 1892	+++	+	-	+	-
150	*Tachysphex costae* (De Stefani, 1881)	++	+	+++	-	-
151	*Tachysphex desertorum* F. Morawitz, 1894	++	+	-	+	-
152	*Tachysphex eryth ropus* (Spinola, 1838)	+++	+	-	++	-
153	*Tachysphex eximius* Pulawski, 1971	-	-	-	-	+
154	*Tachysphex ferrugineus* Pulawski, 1967	+++	-	-	+	-
155	*Tachysphex fugax* (Radoszkowski, 1877)	-	-	-	+	-
156	*Tachysphex fulvita rsis* (Costa, 1867)	++	+++	-	+++	+
157	*Tachysphex grandii* Beaumont, 1965	++	+	++	-	-
158	*Tachysphex gu ssako*	++	-	-	+	-

	vskiji Pulawski, 1971					
159	*Tachysphex helveticus* Kohl, 1885	++	-	-	+	-
160	*Tachysphex hostilis* Kohl, 1901	-	-	-	-	+
161	*Tachysphex incertus* (Radoszkowski, 1877)	++	+	+	+	-
162	*Tachysphex julliani* Kohl, 1883	+++	+++	-	+++	-
163	*Tachysphex laticauda* Gussakovskij, 1933	-	+	-	-	-
164	*Tachysphex latifrons* Kohl, 1884	-	-	-	+	-
165	*Tachysphex mediterraneus* Kohl, 1883	++	-	-	+++	-
166	*Tachysphex melas* Kohl, 1898	++	-	++	+	+
167	*Tachysphex micans* (Radoszkowski, 1877)	+	-	-	+	-
168	*Tachysphex mocsaryi* Kohl, 1884	++	+	-	+	-
169	*Tachysphex morawitzi* Pulawski, 1971	-	+	-	-	-
170	*Tachysphex morosus* F. Smith, 1859	-	-	-	-	+
171	*Tachysphex mochii* de Beaumont, 1947	-	-	-	-	+
172	*Tachysphex nasalis* F. Morawitz, 1893	-	+	-	-	-
173	*Tachysphex nitidior* Beaumont, 1940	++	+	++	+++	+
174	*Tachysphex nitidissimus* Beaumont, 1952	+	-	-	+++	-
175	*Tachysphex nitidus* (Spinola, 1805)	-	+	-	+	-
176	*Tachysphex opacus* F.	-	-	-	+	-

	Morawitz, 1893					
177	*Tachysphex panzeri* (van der Linden, 1829)	+++	+	+++	+	-
178	*Tachysphex persa* Gussakovskij, 1933	+++	-	-	-	-
179	*Tachysphex pompiliformis* Panzer, 1804	++	+	++	+++	-
180	*Tachysphex psammobius* (Kohl, 1880)	-	-	-	+	-
181	*Tachysphex pulcher* Pulawski, 1967	-	-	-	-	+
182	*Tachysphex rugosus* Gussakovskij, 1952	++	-	-	+	-
183	*Tachysphex schmiedeknechti* Kohl, 1883	-	-	-	+	-
184	*Tachysphex sericans* Gussakovskij, 1952	-	-	+	-	-
185	*Tachysphex sordidus* Dahlbom, 1845	-	+	-	-	+
186	*Tachysphex spretus* Kohl, 1901	-	-	-	+	-
187	*Tachysphex speciosissimus* Morice, 1897	-	-	-	-	+
188	*Tachysphex subdentatus* F. Morawitz, 1893	-	+	-	-	-
189	*Tachysphex svetlanae* Pulawski, 1971	-	-	-	-	+
190	*Tachysphex tarsinus* (Lepeletier, 1845)	++	-	-	+++	-
191	*Tachysphex unicolor* (Panzer, 1806-1809)	++	-	-	+++	-
192	*Parapiagetia genicularis* F. Morawitz, 1890	-	-	-	-	+
193	*Parapiagetia rufescens* Gussakovskij, 1952	-	-	-	-	+
194	*Parapiagetia triden*	-	+	-	+	-

	tata Tsuneki, 1972					
195	*Prosopigastra burgeri* Schmid-Egger, 2014	-	-	-	-	+
196	*Prosopigastra c ra ssep unctata* Pulawski, 1979	-	+	-	-	-
197	*Prosopigastra creon* (Nurse, 1903)	-	-	-	+	-
198	*Prosopigastra falsa* (F. Morawitz, 1893)	-	+	-	+++	+
199	*Prosopigastra fumipennis* Gussakovskij, 1952	-	+	-	+	+
200	*Prosopigastra insignis* E. Saunders, 1910	-	-	-	-	+
201	*Prosopigastra nubige ra* Gussakovskij, 1933	-	-	-	-	+
202	*Prosopigastra latifron s* Gussakovskij, 1933	-	-	-	+	-
203	*Prosopigastra orientalis* Beaumont, 1947	++	+	+	+	-
204	*Prosopigastra picea* Pulawski, 1979	-	-	-	+	-
205	*Prosopigastra punctatissma* A. Costa. 1867	-	+	+	-	-
206	*Prosopigastra rufiventris* Gussakovskij, 1933	-	-	-	+	-
207	*Palarus aurantiacus* Radoszkowski, 1893	-	-	-	+	-
208	*Palarus funerarius* F. Morawitz, 1889	++	-	-	-	+
209	*Palarus histrio* Spinola, 1838	-	-	-	+	-
210	*Palarus pictiventris* F. Morawitz, 1890	-	-	-	+	-
211	*Palarus variegatus* (Fabricius, 1781)	++	+	-	+++	-
212	*Plenoculus*	-	-	-	-	+

	murgabensis (Gussakovskij, 1928)					
213	*Solierella bactriana* Gussakovskij, 1930	-	+++	-	+	-
214	*Solierella capparidis* Gussakovskij, 1928	+	-	-	-	-
215	*Solierella chivensis* Gussakovskij, 1928	+	-	-	+	-
216	*Solierella flavicornis* Gussakovskij, 1928	+	-	-	+	-
217	*Solierella gussakovskiji* Menke, 1976	+	-	-	-	-
218	*Solierella nitida* Gussakovskij, 1928	+	-	-	-	-
219	*Solierella zimini* Gussakovskij, 1928	+	-	-	+	-
220	*Miscophus montanus* Gussakovskij, 1935	-	-	-	+	-
221	*Miscophus niger* Dahlbom, 1844	-	-	-	+	-
222	*Miscophus similis* F. Morawitz, 1896	-	-	-	+	-
223	*Miscophus spurius* (Dahlbom, 1832)	-	-	-	+	-
224	*Miscophus gussakovskiji* de Andrade, 1954	-	-	-	+	-
225	*Pison fasciatum* (Radoszkowski, 1876)	-	+	-	-	-
226	*Pison sogdianum* Gussakovskij, 1937	-	-	-	+	-
227	*Pison hissaricum* Gussakovsij, 1937	-	-	-	+	+
228	*Trypoxylon albipes* F. Smith, 1856	+	+	-	+	-
229	*Trypoxylon attenuatum* F. Smith, 1851	-	+	-	-	-

230	*Trypoxylon deceptorium* Antropov, 1991	+++	+	-	+	+
231	*Trypoxylon figulus* (Linnaeus, 1758)	-	+	-	-	-
232	*Trypoxylon kolazyi* Kohl, 1893	-	+	-	+	-
233	*Trypoxylon scutatum* Chevrier, 1867	+++	+	-	+++	-
234	*Trypoxylon turkestanicum* Gussakovskij, 1936	-	+	-	-	-
235	*Eremiasphecium bicolor* Gussakovskij, 1930	-	-	-	-	+
236	*Eremiasphecium desertorum* (Gussakovskij, 1930)	-	-	-	-	+
237	*Eremiasphecium schmiedeknechti* Kohl, 1897	-	-	-	-	+
238	*Belomicroides melas* Antropov, 1994	-	-	-	+	-
239	*Belomicrus affinis* Gussakovskij, 1952	-	+	-	-	-
240	*Belomicrus gussakovskiji* Kazenas et Antropov, 1994	-	-	-	-	+
241	*Belomicrus iliensis* Kazenas, 1991	-	+	-	-	-
242	*Belomicrus kuznetzovi* Gussakovskij, 1952	-	-	-	+	+
243	*Belomicrus minimus* Gussakovskij, 1952	+	+	-	-	-
244	*Belomicrus nasutus* Antropov, 1995	-	+	-	-	-
245	*Belomicrus nigrinus* Kazenas, 1971	-	+	-	-	-
246	*Belomicrus parvulus* (Radoszkowski, 1877)	-	+	-	-	-

247	*Belomicrus shestakovi* Kazenas et Antropov, 1994	-	+	-	-	-
248	*Belomicrus turkmenicus* Kazenas et Antropov, 1994	-	+	-	-	-
249	*Oxybelus albopictus* Radoszkowski, 1877	-	+	+	-	-
250	*Oxybelus aurantiacus* Mocsáry, 1883	++	+	-	++	-
251	*Oxybelus bipunctatus* Olivier, 1811	-	-	++	+	-
252	*Oxybelus canaliculatus* Radoszkowski, 1877	-	+	-	-	-
253	*Oxybelus eburneus* Radoszkowski, 1877	-	-	-	+	-
254	*Oxybelus elongatus* Radoszkowski, 1877	-	-	-	+	-
255	*Oxybelus* Olivier, 1812	-	-	-	+	-
256	*Oxybelus fedtschenkoi* Radoszkowski, 1877	-	+	-	+	-
257	*Oxybelus kizilkumii* Radoszkowski, 1877	-	+	-	+++	-
258	*Oxybelus lamellatus* Olivier, 1811	++	+	-	+	-
259	*Oxybelus latidens* Gerstecker, 1867	-	+	-	++	-
260	*Oxybelus latro* Olivier, 1811	-	-	-	+++	-
261	*Oxybelus maculipes* F. Smith, 1856	-	+	+	+	-

262	*Oxybelus ma ndibul aris* Dahlbom, 1845	-	-	+	+	-
263	*Oxybelus m arac andicus* Radoszkowski, 1877	-	-	+	+	-
264	*Oxybelus mucronatus* (Fabricius, 1793)	-	+	+	-	-
265	*Oxybelus pectoralis* F. Morawitz, 1893	+	-	-	+	-
266	*Oxybelus quattu* Jurine, 1807	++	+	-	++	-
267	*Oxybelus saraf schani* Radoszkowski, 1877	-	-	-	+	-
268	*Oxybelus spinulosus* Gussakovskij, 1935	-	+	-	+	-
269	*Oxybelus varie gatus* Wesmael, 1852	-	+	-	-	-
270	*Entomognathus brevis* (Vander Linden, 1829)	-	+++	+	+++	+
271	*Entomognathus breviusculus* (Gussakovskij, 1952)	-	-	-	-	+
272	*Lestica alata* Panzer, 1797	-	-	+	-	-
273	*Lestica clypeat a* (Schreber, 1759)	-	+	-	-	-
274	*Lestica wollmanni* Kohl, 1915	-	-	-	-	+
275	*Lindenius aegyptius* (Kohl, 1888)	-	+	-	-	-
276	*Lindenius albilab ris* Fabricius, 1793	-	+	-	-	-
277	*Lindenius aptus* Marshakov, 1973	-	-	+	-	-

278	*Lindenius gus sakovs kii* Marshakov, 1973	-	+	-	-	-
279	*Lindenius mesopleuralis* (F. Morawitz, 1890)	-	+	-	-	-
280	*Lindenius pallidicornis* (F. Morawitz, 1890)	-	-	+	-	-
281	*Lindenius panzeri* (Vander Linden, 1829)	-	+	+	+++	-
282	*Lindenius satschouanus* (Kohl, 1915)	-	-	+	-	-
283	*Rhopalum gracile* Wesmael, 1852	-	+	-	-	-
284	*Rhopalum clavipes* (Linnaeus, 1758)	-	-	-	+	-
285	*Crossocerus annulipes* (Lepeletier et Brullé, 1834)	-	+	-	-	-
286	*Crossocerus elon gatulus* (Vander Linden, 1829)	-	+	-	-	-
287	*Crossocerus esau* Beaumont, 1967	-	+	-	-	-
288	*Crossocerus jubilans* (Kohl, 1915)	-	+	-	-	-
289	*Crossocerus quadrimaculatus* (Fabricius, 1793)	-	+	-	-	-
290	*Crossocerus stra ngulatu s* (Bischoff, 1930)	-	+	-	-	-
291	*Crossocerus kohli* (Bischoff, 1921)	-	+	-	-	-
292	*Crossocerus vagabundus* (Panzer, 1799)	-	+	-	-	-
293	*Crossocerus varus* Lepeletier de Saint Fargeau et Brullé, 1835	-	+	-	-	-
294	*Crabro altaicus* F. Morawitz, 1892	-	+	-	++	+
295	*Crabro altigena*	-	+	-	-	-

	Dalla Torre, 1897					
296	*Crabro filiformis* Radoszkowski, 1877	-	+	-	-	-
297	*Crabro mocsaryi* Kohl, 1915	-	+	-	-	-
298	*Crabro tuberculiger* Kohl, 1915	-	+	-	-	-
299	*Crabro uljanini* Radoszkowski, 1877	-	-	+	-	-
300	*Odontocrabro temporalis* (Gussakovskij, 1952)	-	+	-	-	-
301	*Ectemnius confinis* (Walker, 1871)	-	-	-	++	+
302	*Ectemnius continuus* (Fabricius, 1804)	-	+	-	++	-
303	*Ectemnius cruscicornis* (Spinola, 1808)	-	+	-	++	-
304	*Ectemnius flagellarius* (F. Morawitz, 1892)	-	-	-	+	-
305	*Ectemnius fossorius* (Linnaeus, 1758)	-	+	++	++	-
306	*Ectemnius meridionalis* (A. Costa, 1871)	-	-	+	-	-
307	*Ectemnius sexcinctus* (Fabricius, 1775)	-	+	-	-	-
308	*Ectemnius uropho ri* (Radoszkowski, 1877)	-	-	-	+	-
309	*Ectemnius varentzowi* (F. Morawitz, 1894)	-	-	-	+	-
310	*Entomosericus kaufmanni* Radoszkowski, 1877	-	+	-	+	-
311	*Alysson* Radoszkowski, 1877	-	-	-	+	-
312	*Didineis turanica* Gussakovskij,	-	-	-	+	-

	1937					
313	*Didineis bactriana* Gussakovskij, 1937	-	-	-	+	-
314	*Didineis bucharica* Gussakovskij, 1937	-	-	-	-	+
315	*Didineis clavimana* Gussakovskij, 1937	-	-	-	+	-
316	*Nysson argentejfasciatus* Radoszkowski, 1879	-	-	-	+	-
317	*Nysson barrei* Radoszkowski, 1893	-	+	-	-	-
318	*Nysson cardinalis* Gussakowski, 1929	+	-	-	-	-
319	*Nysson castaneus* Radoszkowski, 1877	-	-	-	+	-
320	*Nysson decemmaculatus* Spinola, 1807	-	+	-	-	-
321	*Nysson harveyi* de Beaumont, 1967	-	-	-	-	-
322	*Nysson maculosus* (Gmelin, 1790)	-	+	-	++	-
323	*Nysson quadriguttatus* Spinola, 1807	-	+	-	-	-
324	*Nysson tridens* Gerstaecker, 1867	-	+	-	-	-
325	*Synnevrus decemmaculatus* (Spinola, 1808)	-	+	-	-	-
326	*Brachystegus scalaris* (Illiger, 1807)	++	+	-	-	-
327	*Brachystegus incertus* (Radoszkowski, 1877)	-	-	-	+	-
328	*Olgia modesta* Radoszkowski, 1877	-	-	-	+	-
329	*Argogorytes hispa*	-	+	-	-	-

	nicus (Mercet, 1906)					
330	*Gorytes albidulus* (Lepeletier, 1832)	-	+	-	-	-
331	*Gorytes ambiguus* Handlirsch, 1888	-	-	-	+	-
332	*Gorytes kohlii* Handlirsch, 1888	-	-	-	-	+
333	*Gorytes quinquefasciatus* (Panzer, 1798)	-	+	-	++	-
334	*Gorytes sulcifrons* (A.Costa, 1869)	-	+	++	++	-
335	*Gorytes tobiasi* Nemkov, 1990	-	+	-	-	-
336	*Lestiphorus egregius* (Handlirsch, 1893)	-	+	+	-	-
337	*Lestiphorus oreophilus* (Kuznetzov-Ugamski, 1927)	-	+	-	-	-
338	*Oryttus dives* Nemkov, 1992	-	+	-	-	-
339	*Ammatomus asiaticus* (Radoszkowski, 1886)	-	+	-	-	-
340	*Ammatomus coarctatus* (Spinola, 1808)	-	+++	-	+	-
341	*Ammatomus mesostenus* (Handlirsch, 1888)	+	-	+	+	+
342	*Ammatomus rogenhoferi* (Handlirsch, 1888)	-	+	-	-	-
343	*Ammatomus rufonodis* (Radoszkowski, 1877)	-	+	-	+	+
344	*Bembix bicolor* Radoszkowski, 1877	-	-	-	+	-
345	*Bembix dilatata* Radoszkowski, 1877	-	+	-	-	-
346	*Bembix*	-	+	-	-	-

	dubia Gussakovskij, 1934					
347	*Bembix diversipes* F. Morawitz, 1889	-	+	-	-	-
348	*Bembix eburnea* Radoszkowski, 1877	+	-	-	-	-
349	*Bembix lutescens* Radoszkowski, 1877	+++	-	-	+	-
350	*Bembix megerlei* Dahlbom, 1845	-	-	-	+++	-
351	*Bembix niponica* F. Smith, 1873	-	+	-	-	-
352	*Bembix oculata* Panzer, 1801	+++	+	-	+++	+
353	*Bembix olivacea* Fabricius, 1787	-	-	+	-	-
354	*Bembix pallida* Radoszkowski, 1877	-	-	+	-	-
355	*Bembix planifrons* F. Morawitz, 1891	+++	-	-	-	-
356	*Bembix portschinskii* Radoszkowski, 1884	++	-	-	+	-
357	*Bembix rostrata* (Linnaeus, 1758)	+	+	-	++	+
358	*Bembix transcaspica* Radoszkowski, 1893	+++	-	-	-	-
359	*Bembix tadzhika* Kazenas, 1980	-	-	-	+	-
360	*Harpactus betpakdalensis* Kazenas, 1988	-	-	-	-	+
361	*Harpactus formosus* (Jurine, 1807)	-	+	-	-	-
362	*Harpactus annulatus* Eversmann, 1849	-	+	-	-	-
363	*Harpactus tjanshanicus* Kazenas, 1992	-	+	-	-	-

364	*Hoplisoides craverii* (A. Costa, 1869)	-	+	-	-	-
365	*Hoplisoides latifrons* (Spinola, 1808)	-	+	-	-	-
366	*Hoplisoides punctuosus* Eversmann, 1849	-	-	-	-	+
367	*Sphecius antennatus* (Klug, 1845)	-	+	-	-	+
368	*Sphecius conicus* (Germar, 1817)	-	+	-	-	-
369	*Sphecius nigricornis* (Dufour, 1838)	-	+	-	+	-
370	*Sphecius uljanini* (Radoszkowski, 1877)	-	-	-	+	-
371	*Kohlia pavlovskii* (Gussakovskij, 1952)	-	-	-	+	+
372	*Psammaecius luxuriosus* (Radoszkowski, 1877)	-	-	-	+	-
373	*Psammaecius punctulatus* (Vander Linden, 1829)	-	+	-	++	-
374	*Stizus annulatus* (Klug, 1845)	+++	+	-	+++	+
375	*Stizus bipunctatus* (F. Smith, 1856)	-	-	-	+	-
376	*Stizus dispar* F. Morawitz, 1888	+	-	+	+	-
377	*Stizus emir* Handlirsch, 1901	-	-	-	+	-
378	*Stizus euchromus* Handlirsch, 1892	-	-	-	+	+
379	*Stizus fasciatus* (Fabricius, 1781)	+++	-	-	+++	+
380	*Stizus fedtschenkoi* Radoszkowski, 1877	-	+	-	+	-
381	*Stizus histrio* F.	-	+	-	+	-

	Morawitz, 1888					
382	*Stizus handlirschi* Radoszkowski, 1893	-	-	-	+	-
383	*Stizus koenigi* F. Morawitz, 1888	+++	-	-	+	-
384	*Stizus praestans* F. Morawitz, 1893	-	-	-	+	-
385	*Stizus perrisi* Dufour, 1838	+++	-	-	++	-
386	*Stizus raddei* Handlirsch, 1889	-	+	-	-	-
387	*Stizus ruficornis* (J. Forster, 1771)	+++	+	-	-	-
388	*Stizus rufiventris* Radoszkowski, 1877	+	+	-	+++	+
389	*Stizus bizonatus* Spinola, 1839	-	-	-	+	-
390	*Stizus zhelochovtzevi* Gussakovskij, 1952	-	-	+	-	-
391	*Stizoides crassicornis* (Fabricius, 1787)	-	++	-	+++	-
392	*Stizoides cyanopterus* (Gussakovskij, 1928)	+	-	-	-	-
393	*Stizoides egregius* (Gussakopvskij, 1928)	-	+	-	-	-
394	*Stizoides melanopterus* (Dahlbom, 1845)	+++	+	-	+	+
395	*Stizoides tridentatus* (Fabricius, 1775)	++	+	-	+++	-
396	*Bembecinus asiaticus*	+	+	-	+	+

	Gussakovskij, 1936					
397	*Bembecinus cyan escens* (Radoszkowski, 1877)	+	+	-	-	-
398	*Bembecinus tridens* (Fabricius, 1781)	-	+++	-	+++	-
399	*Philanthus coron atus* (Thunberg, 1784)	-	+	++	-	-
400	*Philanthus elegantissimus* Dalla Torre, 1897	-	-	-	-	+
401	*Philanthus decemmaculatus* Eversmann, 1849	-	+	-	-	-
402	*Philanthus desertorum* F. Morawitz, 1890	-	+	-	++	-
403	*Philanthus kohlii* F. Morawitz, 1890	-	-	-	-	+
404	*Philanthus koka ndicus* Radoszkowski, 1877	-	-	+	-	-
405	*Philanthus reinigi* Bischoff, 1930	-	-	-	-	+
406	*Philanthus komarowi* F. Morawitz, 1890	-	+	-	-	-
407	*Philanthus triangulum* (Fabricius, 1775)	-	+++	-	++	-
408	*Philanthus venustus* Rossi, 1790	++	-	-	-	-
409	*Philanthus varie gatus* Spinola, 1838	-	+	-	-	-
410	*Pseudoscolia armata* Kazenas, 1994	-	-	-	-	+
411	*Pseudoscolia deserti ca* Kazenas, 1993	-	-	-	+	-
412	*Pseudoscolia diversicornis* (F. Morawitz, 1894)	-	+	-	-	-
413	*Pseudoscolia gloriosa* Kazenas, 1994	-	+	-	-	-

414	*Pseudoscolia maculata* Radoszkowski, 1876	-	+	-	-	-
415	*Pseudoscolia simplicicornis* (F. Morawitz, 1894)	+	-	-	++	-
416	*Cerceris acuta* Radoszkowski, 1877	-	+	-	-	+
417	*Cerceris albo fasciata* (Rossi, 1790)	++	+	+	+++	-
418	*Cerceris andrei* Gussakovskij, 1952	-	-	-	+	-
419	*Cerceris angustata* F. Morawitz, 1893	-	-	-	+	-
420	*Cerceris angelic a* Kazenas, 1977	-	-	-	+	-
421	*Cerceris ansa* Shestakov, 1914	-	-	+	-	-
422	*Cerceris antennata* F. Morawitz, 1890	-	+	-	-	-
423	*Cerceris arenari a* (Linnaeus, 1758)	+++	+	-	+++	-
424	*Cerceris argen tosa* Shestakov, 1912	++	+	-	-	-
425	*Cerceris barc hanica* Kazenas, 1984	-	+	-	-	-
426	*Cerceris bicincta* Klug, 1835	++	+	-	++	-
427	*Cerceris bracte ata* Eversmann, 1849	-	+	-	-	-
428	*Cerceris bup resticida* Dufour, 1841	++	+++	+	+	-
429	*Cerceris circula ris* (Fabricius, 1804)	-	+	-	+	-
430	*Cerceris crenul ifer* Kazenas, 1974	-	+	-	-	-
431	*Cerceris cupes*	-	+	-	-	-

	Shestakov, 1918					
432	*Cerceris deserticola* F. Morawitz, 1890	++	+	-	+++	-
433	*Cerceris dispar* Dahlbom, 1845	-	+	-	-	-
434	*Cerceris dorsalis* Eversmann, 1849	-	+	-	+	-
435	*Cerceris edolata* Shestakov, 1912	-	+	-	-	-
436	*Cerceris errata* Shestakov, 1918	-	-	-	+	-
437	*Cerceris eryngii* Marquet, 1875	-	+	-	-	-
438	*Cerceris erythrogaster* Kazenas, 1972	-	-	-	+	-
439	*Cerceris elegans* Eversmann, 1849	-	-	+	+	-
440	*Cerceris ferusa* Kazenas, 1979	-	+	-	-	-
441	*Cerceris fimbriata* (Rossi, 1790)	-	+++	+	+	-
442	*Cerceris flavic ornis* Brullé, 1833	-	+	-	+	-
443	*Cerceris flavila bris* (Fabricius, 1793)	-	-	-	+	+
444	*Cerceris fodiens* Eversmann, 1849	-	-	+	-	-
445	*Cerceris furcata* F. Morawitz, 1890	-	-	-	+	-
446	*Cerceris hohlbe cki* Shestakov, 1914	-	-	-	+	-
447	*Cerceris icta* Shestakov, 1918	-	-	-	+	-
448	*Cerceris integra* F. Morawitz, 1894	-	-	-	+	-
449	*Cerceris interrupta* Panzer, 1799	-	+++	-	-	-
450	*Cerceris kokuevi*	-	-	-	-	+

	Shestakov, 1912					
451	*Cerceris kurzenkoi* Kazenas, 1980	-	-	-	-	+
452	*Cerceris kuznetzovi* Kazenas, 1984	-	+	-	-	-
453	*Cerceris lunata* A. Costa, 1869	-	+	-	+	-
454	*Cerceris interrupta* (Panzer, 1799)	-	+	-	-	-
455	*Cerceris maculata* Radoszkowski, 1877	-	-	-	+	-
456	*Cerceris maracandica* Radoszkowski, 1877	-	-	-	+	-
457	*Cerceris media* Klug, 1835	-	+	-	+	-
458	*Cerceris meditata* Shestakov, 1918	-	+	-	+	-
459	*Cerceris morawitzi* Mocsáry, 1883	-	+	-	-	-
460	*Cerceris nargiza* Kazenas, 1984	-	+	-	++	-
461	*Cerceris pseudoflavescens* Shestakov, 1925	-	+	-	-	-
462	*Cerceris quadricincta* (Panzer, 1799)	-	+	-	+	+
463	*Cerceris rothnei* Cameron, 1890	-	+	-	-	-
464	*Cerceris rubida* Jurine, 1807	-	+	+	+	-
465	*Cerceris ruficornis* (Fabricius, 1793)	-	+	-	-	+
466	*Cerceris rybyensis* (Linnaeus, 1771)	-	-	-	+++	-
467	*Cerceris sabulosa* (Panzer, 1799)	-	+	+	+++	+
468	*Cerceris*	-	+	-	+	-

	schlettereri Radoszkowski, 1888					
469	*Cerceris scutifer a* Shestakov, 1914	-	-	-	+	-
470	*Cerceris shest akovi* Gussakovskij, 1952	-	-	-	+	-
471	*Cerceris sh esta koviana* Gussakovskij, 1952	-	-	-	+	-
472	*Cerceris sirdariensis* Radoszkowski, 1877	-	-	-	+	-
473	*Cerceris specularis* A. Costa, 1869	-	+	-	-	-
474	*Cerceris spinifer a* Kazenas, 1974	-	-	-	-	+
475	*Cerceris spinipectus* F. Smith, 1856	-	+	-	-	-
476	*Cerceris strami nea* Dufour, 1853	++	+	-	-	-
477	*Cerceris tenuivittata* Dufour, 1849	-	+	-	-	-
478	*Cerceris tetra donta* Cameron, 1890	-	+	-	-	-
479	*Cerceris tinnula* Gussakovskij, 1952	-	+	-	+	+
480	*Cerceris tube rculata* Villers, 1789	-	+	-	++	-
481	*Cerceris turanic a* Kazenas, 1980	-	+	+	+++	-
482	*Cerceris tur kestan ica* Radoszkowski, 1893	-	+	-	+	-
483	*Cerceris uvarovi* Kazenas, 1984	-	+	-	-	-
484	*Cerceris vitticollis* F.	-	-	-	+	-

	Morawitz, 1894					
	Total	125	253	66	261	101

Table 3. *Distribution of digging wasps (Sphecidae, Crabronidae) in the geographical areas of Uzbekistan*

Notes: General types: (+) – types mentioned in the literature; (++) – Species identified during our research; (+++) – Species identified in the literature and during our research; (-) – not determined in studies.

Furthermore, when we performed a cluster of similarity of digging wasps in five regions of Uzbekistan, the species of the North-Western region and the Central region of Uzbekistan were the closest 30% similar, which is explained by the fact that they are species of adjacent regions, i.e. desert species (Table 4).

Regions	North- Western	North- Eastern	Eastern	Central	Southern
North-Western	1	-	-	-	-
North-Eastern	0.20	1	-	-	-
Eastern	0.14	0.12	1	-	-
Central	0.30	0.28	0.13	1	-
Southern	0.14	0.12	0.07	0.14	1

Table 4. *Similarity coefficient of digger wasps' fauna of the compared areas*

Faunas, which are the most distant from each other in terms of species composition, are 7% similar to the species of the Eastern region and the Southern region of Uzbekistan.

In the climatic conditions of Uzbekistan, 84 species were recorded from the arid regions of Uzbekistan from the 1870s to the present, including by V.V.Gussakovskij during 1927–1952: the species such as Sphecidae: *Sphex oxianus*, *Eremochares mirabilis* and Crabronidae: *Ammoplanus angularis*, *Astata costae*, *Gastrosericus flavicornis*, *Prosopigastra latifrons*, *Solierella capparidis*, *Solierella chivensis*, *Solierella flavicornis*, *Solierella gussakovskiji*, *Solierella nitida*, *Solierella zimini*, *Miscophus montanus*, *Pison fasciatum*, *Pison sogdianum*, *Pison hissaricum*, *Belomicrus kuznetzovi*, *Belomicrus minimus*, *Didineis turanica*, *Nysson cardinalis*, *Stizus zhelochovtzevi*, *Stizoides cyanopterus* were only mentioned information by Gussakovskij.

Sh.D. Islamov recorded 153 species from the mountainous regions of Uzbekistan during his research conducted between 1971 and 1986, and among these species..., Sphecidae: *Chlorion regale*; Crabronidae: *Psenulus pallipes*, *Astata costae*, *Tachysphex grandii*, *Tachysphex morawitzi*, *Lestica wollmanni*, *Crossocerus annulipes*, *Crossocerus strangulatus*, *Argogorytes hispanicus*, *Sphecius conicus*, *Cerceris tetradonta* were mentioned only in the works of Sh.D.Islamov. In the scientific works of O. Radoszkowski in 1877–1891, 82 species were recorded, of which species such as Sphecidae: *Prionyx sirdariensis*; Crabronidae: *Tachysphex fugax*, *Oxybelus albopictus*, *Oxybelus canaliculatus*, *Oxybelus elongatus*, *Oxybelus maracandicus*, *Oxybelus sarafschani*, *Lestica alata*, *Crabro filiformis*, *Crabro uljanini*, *Alysson maracandensis*, *Nysson castaneus*, *Brachystegus incertus*, *Olgia modesta*, *Ammatomus asiaticus*, *Sphecius uljanini*, *Psammaecius luxuriosus* were mentioned only in the works of Radoszkowski. Y.N. Danilov recorded 82 species in his articles during 2012–2022, of which species such as Sphecidae: *Palmodes hissaricus*, *Palmodes orientalis*, *Ammophila nemkovi*, *Ammophila turkestana*, *Podalonia caucasica* were mentioned only in the works of Danilov. More than 450 species were recorded by V.L. Kazenas in his scientific works during 1978–2002, of which species such as Sphecidae: *Prionyx viduatus*; Crabronidae: *Mimesa kazenasi*, *Mimesa pulawskii*, *Mimesa shestakovi*, *Diodontus ammobius*, *Diodontus puncticeps*, *Spilomena fulvicornis*, *Dinetus psammophilus*, *Liris atrata*, *Tachytes alfierii*, *Tachytes argyreus*, *Tachytes lanuginosus*, *Tachytes levantinus*, *Tachytes matronalis*, *Tachytes popovi*, *Tachysphex nasalis*, *Palarus histrio*, *Palarus pictiventris*, *Miscophus similis*, *Miscophus spurius*, *Belomicrus affinis*,

Belomicrus iliensis, *Belomicrus gussakovskiji*, *Belomicrus nigrinus*, *Belomicrus shestakovi*, *Lindenius mesopleuralis*, *Lindenius pallidicornis*, *Crossocerus esau*, *Crossocerus jubilans*, *Crabro tuberculiger*, *Odontocrabro temporalis*, *Ectemnius flagellarius*, *Nysson argentejfasciatus*, *Nysson barrei*, *Synnevrus decemmaculatus*, *Bembix dubia*, *Bembix gracilis*, *Bembix olivacea*, *Harpactus tjanshanicus*, *Hoplisoides craverii*, *Stizus dispar*, *Philanthus decemmaculatus*, *Pseudoscolia desertica*, *Cerceris barchanica*, *Cerceris crenulifer*, *Cerceris erythrogaster*, *Cerceris furcata*, *Cerceris morawitzi*, *Cerceris pseudoflavescens*, *Cerceris rothnei*, *Cerceris shestakovi*, *Cerceris uvarovi* were mentioned only in the works of Kazenas. A.V. Antropov recorded 101 species , of which species such as Crabronidae: *Miscophus gussakovskiji*, *Belomicroides melas*, *Belomicrus nasutus*, *Oxybelus haemorrhoidalis*, *Oxybelus variegatus*, *Lindenius gussakovskii*, *Crossocerus kohli*, *Crossocerus vagabundus*, *Nysson decemmaculatus*, *Nysson harveyi*, *Bembix diversipes*, *Harpactus annulatus*, were mentioned only in the works of A.V. Antropov. W.J. Pulawski recorded 51 species in his articles during 1965–1979, of which species such as Crabronidae: *Tachysphex brevipes*, *Tachysphex latifrons*, *Tachysphex psammobius*, *Tachysphex sericans*, *Tachysphex svetlanae*, P*arapiagetia genicularis*, *Prosopigastra crassepunctata*, *Prosopigastra creon*, *Prosopigastra picea* were mentioned only in the works of Pulawski. A.V. Shestakov recorded 27 species in 1917–1923, of which species such as Crabronidae: *Cerceris ansa*, *Cerceris angustata*, *Cerceris hohlbecki*, *Cerceris icta*, *Cerceris interrupta*, *Cerceris meditata* were mentioned only in his works. In the scientific works of M.V. Mokrousov in 1993–2020, 186 species were recorded, of which Sphecidae: *Ammophila meridionalis*; Crabronidae: *Pseudoscolia armata*, *Dinetus turanicus*, *Dinetus rakhimovi*, *Dryudella aralensis*, *Dryudella rasnitsyni*, *Prosopigastra burgeri*, *Tachysphex eximius*, *Tachysphex mochii*, *Tachysphex morosus*, *Tachysphex speciosissimus*, *Eremiasphecium desertorum*, *Eremiasphecium schmiedeknechtii*, *Gastrosericus moricei*, *Gorytes kohlii*, *Harpactus betpakdalensis*, *Hoplisoides punctuosus*, *Parapiagetia rufescens*, *Philanthus elegantissimus*, *Philanthus kohlii*, *Philanthus reinigi*, *Prosopigastra burgeri*, *Prosopigastra insignis*, *Prosopigastra nubigera*, *Pseudoscolia armata*, *Spilomena mocsaryi*, *Cerceris kurzenkoi*, *Cerceris kokuevi*, *Cerceris spinifera* were mentioned only in the works of Mokrousov. H. Dollfuss recorded 16 species in his article in 2013, of which species such as Sphecidae: *Ammophila altigena*, *Ammophila kohli* were mentioned only by Dollfuss. F.F. Kohl recorded 4 species in his works during 1888–1906, of which species such as Sphecidae: *Ammophila induta* was only mentioned by this author. V.G. Marshakov recorded 4 species in his articles during 1973–1976, of which species such as Crabronidae: *Ammoplanops carinatus*, *Lindenius aptus* were mentioned only by Marshakov. 89 species were recorded by P.G Nemkov in his works during 1990–2016, of which species such as Crabronidae: *Didineis clavimana*, *Bembix tadzhika* were mentioned only by Nemkov and a total of 126 species (26%) were not found during our studies and other authors. For the fauna of Uzbekistan, *Philanthus venustus* Rossi, 1790 species of the Crabronidae family was identified for the first time. This species was identified on 21.05.2023 from the Kyzylkum desert of Karaozek district (42°43′34.03″N 60°00′37.79″E). Furthermore, when we made a similarity cluster of digger wasps in five regions of Uzbekistan, the species of the North-Western region and the Central region of Uzbekistan were the closest 30% similar, which is explained by the fact that they are species of adjacent regions, i.e. desert species 25 (4.9%) of the 484 species of digger wasps in the fauna of Uzbekistan are very rare, 8 of them are endemic to Uzbekistan: *Ammophila nemkovi* Danilov, 2018, *Eremochares ferghanica* Gussakovskij, 1930, *Dinetus rakhimovi* Mokrousov et Khedher, 2020, *Tachytes alfierii* Pulawski, 1962, *Tachysphex brevipes* Pulawski, 1971, *Solierella nitida* Gussakovskij, 1928, *Belomicroides melas* Antropov, 1994, *Cerceris schlettereri* Radoszkowski, 1888. Thus, 10 species included in the "Red Book of Uzbekistan" (*Chlorion regale* F. Smith, 1873, *Sceliphron shestakovi* Gussakovskij, 1928, *Prionyx haberhaueri* (Radoszkowski, 1871), *Prionyx macula* (Kohl, 1889), *Prionyx nigropectinatus* (Taschenberg, 1869), *Eremochares mirabilis* (Gussakovskij, 1928), *Laphyragogus kohlii* (Bingham, 1896), *Larra transcaspica* F. Morawitz 1894, *Lestiphorus oreophilus* (Kuznetzov-Ugamski, 1927), *Kohlia pavlovskii* (Gussakovskij, 1952), and 2 species (*Sceliphron shestakovi*, *Prionyx haberhaueri*) were observed during our research. According to literature sources, *Sceliphron shestakovi* Gussakovskij, 1928 is distributed in Uzbekistan in Parkent district of Tashkent region, Nurota mountains of Navoi region. During our research, it was identified in the village of Suqoq, Parkent district, Tashkent region on May 17, 2021 (41°14′19.91″N

69°50′06.57″E). The species *Sceliphron shestakovi* lives in oases and valleys of foothill rivers. Very rare. It breeds once a year. First flight and egg-laying occur in June-August, it feeds on the flowers of various plants, mainly Apiaceae. The female representatives hunt spiders (Aranei), paralyze them, and lay their eggs in one of the houses made of moist clay. *Prionyx haberhaueri* (Radoszkowski, 1871) was observed on June 02, 2021 at Nurota mountain, Navoi region (40°31'43.04"N 66°46'12.55"E). According to literature sources, it is distributed in Uzbekistan in Parkent district of Tashkent region, Nurota mountain of Navoi region and Samarkand, Jizzakh, Kashkadarya regions. *Prionyx haberhaueri* is a rare Iranian-Turonian species. It lives in the gravel and soil areas of the low mountains. It breeds once a year. The first flight and laying eggs occur in June-August, they are fed on the flowers of various Asteraceae representative plants. Females hunt grasshoppers (Acridoidea), paralyze them, place them in a nest dug in the ground, and then lay eggs in one of them (Nurzhanov and others).

Conclusion

In conclusion, specimens collected from digger wasps represent 48% in spring, 40% in summer, and 12% in autumn. Of the collected samples, 1250 were collected by the Insect nets method, about 500 by the Malaise trap, and more than 200 by the yellow pan trap.

Digger wasps of Uzbekistan were fully analyzed, as a result, total 484 species, of which 69 species belonging to Sphecidae family, 415 species to Crabronidae family, 21 tribes and 74 genera were recorded in our republic.

We found that in Uzbekistan, 14.2% of the total digging wasps belong to Sphecidae family, and 85.7% to the Crabronidae family. It includes 11 subfamilies Crabroninae equals to 24.8%, Bembicinae 18.2%, Philanthinae 17.8 %, Eremiaspheciinae 15.7 %, Ammophilinae 7.2 %, Pemphredoninae 6.6 %, Sphecinae 5.2 %, Astatinae 2.1 %, Sceliphrinae 1.8 % and Dinetinae 0.6 %.

During our research conducted in 2021-2023, 26 species belonging to the Sphecidae family and 69 species belonging to the Crabronidae family, totaling 95 species, were identified. 62 species were identified in the North-Western region, 2 species in the North-Eastern region, 16 species in the Eastern region, and 39 species in the Central region.

Digger wasps have the closest 30% similarity between the species of the North-Western region and the Central region of Uzbekistan, while the Eastern and Southern regions have the least similarity.

Half of the digger wasps are indigenous to desert habitats, while 36% thrive in mountainous and lowland regions, and a minimum of 14% inhabit agrocenose landscapes.In the Uzbekistan fauna, 25 species (5.1%) of digger wasps (Sphecidae, Crabronidae) are classified as very rare. Eight of these species are exclusive to Uzbekistan, and ten species are listed in the "Red Book of the Republic of Uzbekistan".

Acknowledgements

We are grateful to Wojciech J. Puławski (Department of Entomology, California Academy of Sciences) and Y.N. Danilov (Institute of Systematics and Ecology of Animals Siberian Branch Russian Academy of Science) for their assistance in using and searching for additional literature sources.

References

Antropov AV (1991) On taxonomic rank of *Trypoxylon attenuatum* Smith (Hymenoptera, Sphecidae). Entomological Review 70. 672–685. [In Russian]

Antropov AV (1994) Sphecid wasps of the genus *Belomicroides* (Hymenoptera, Sphecidae) of Asia. Journal of Zoology 73(1): 89–96. [In Russian]

Antropov AV (1994) A review of the agile species group of *Pison* (Hymenoptera: Sphecidae: Trypoxylini). Journal of Hymenoptera Research 3: 119–132.

Chao A, Chazdon RL, Colwell RK, Shen TJ (2005) New statistical approach for assessing similarity of speciescomposition with incidence and abundance data. Ecology Letters 8: 148–159. https://doi.org/10.1111/j.1461-0248.2004.00707.x

Danilov YuN (2012) The digger wasps of the genus *Prionyx* Vander Linden (Hymenoptera: Sphecidae) of Russia and Central Asia, with a key to species, new synonymies, and lectotype designations. Zootaxa 3526(1): 59–71. https://doi.org/10.11646/zootaxa.3526.1.6

Danilov YuN (2018) Four new species of the digger wasp genus *Ammophila* W. Kirby, 1798 (Hymenoptera, Sphecidae) from Central Asia. Zootaxa 4457(2): 322–328. https://doi.org/10.11646/zootaxa.4457.2.9

Danilov YuN, Byvaltsev AM (2020) The digger wasps of the genus *Palmodes* Kohl, 1890 in Central Asia (Hymenoptera: Sphecidae: Prionychini). Zootaxa 4803(3): 401–434. https://doi.org/10.11646/zootaxa.4803.3.1

Danilov YuN, Odinsev OA (2022) *Ammophila turkestana* Kohl, 1906 (Hymenoptera: Sphecidae), a valid species. Far Eastern Entomologist 466: 16–20.

Davletshina AG, Avenesova GA, Mansurov AK (1979) Entomofauna of Southwestern Kyzylkum. Fan, Uzbek SSR, 117 pp.

Dollfuss H (2013) Revision of the wasp genus *Ammophila* Kirby 1798 (Hymenoptera: Apoidea: Sphecidae) of the Palearctic Region and India. Linzer Biologische Beiträge 45: 383–564.

Golub VB (2012) Collections of insects: collection, processing and storage of material. Association of Scientific Publications, KMK, Moscow, 339 pp.

Gussakovskij VV (1927) Palearctic species of the genus *Astatus* Latr. (Hymenoptera, Sphecidae). Yearbook of the Zoological Museum of the USSR Academy of Sciences 28: 265–296. [In Russian]

Gussakovskij VV (1928) New Species of Sphecidae from Transcaspia and Khiva. Bulletin de lInstitut de Zoologie Appliquée et de Phytopathologie 4: 3–19.

Gussakovskij VV (1928) Palearctic species of the genus *Solierella* Spin. (Hymenoptera, Sphecidae). Russian Entomological Review 22: 78–84.

Gussakovskij VV (1930) Stinging hymenoptera. In: Proceedings of the Pamir expedition of 1928. II. Zoology. USSR Academy of Sciences Publ., Leningrad, 67–78.

Gussakovskij VV (1930) New and littleknown species of the genera *Ammophila* Kby. and *Sphex* L. (Hymenoptera, Sphecidae). Russian Entomological Review 24: 199–211. [In Russian]

Gussakovskij VV (1930) Amendments and additions to the revision of the genus *Solierella* Spin. (Hymenoptera). Russian Entomological Review 24: 232–235. [In Russian]

Gussakovskij VV (1931) Eastern Palearctic species of the genus *Gastrosericus* Spin. (Hymenoptera, Sphecidae). Yearbook of the Zoological Museum of the USSR Academy of Sciences 31: 449–457. [In Russian]

Gussakovskij VV (1933) Revisio goneris *Prosopigastra* Costa (s. lat.) (Hymenoptera, Sphecidae). Entomological Review 25: 154–173. [In Russian]

Gussakovskij VV (1935) To the fauna of wasps (Hymenoptera, Sphecodea et Vespodea) of Tajikistan. Proceedings of the Tajik Academy of Sciences of the USSR 5: 409–467. [In Russian]

Gussakovskij VV (1936) Palearctic species of the genus *Trypoxylon* Latr. Hymenoptera, Sphecidae. Proceedings of the Zoological Institute of the USSR Academy of Sciences 3: 639–667. [In Russian]

Gussakovskij VV (1937) Review of Palearctic species of the genera *Didineis* Wesm., *Pison* Latr. and *Psen* Latr. (Hymenoptera Sphecodea). Proceedings of the Zoological Institute of the USSR Academy of Sciences 4: 599–698. [In Russian]

Gussakovskij VV (1952) New and littleknown species of Psammocharidae and Sphecidae (Hymenoptera) western Tajikistan. Proceedings of the Zoological Institute of the USSR Academy of Sciences 10: 199–288. [In Russian]

Hensen RV (1987) Revision of the subgenus *Prosceliphron* van der Vecht (Hymenoptera, Sphecidae). Tijdschrift voor Entomologie 129: 217–261. https://www.biodiversitylibrary.org/part/69311

Islamov ShD (1971) A study of the wasp genus *Sceliphron* Klug (Hymenoptera, Sphecidae) in Uzbekistan. Uzbek Biological Journal 4: 55–57. [In Russian]

Islamov ShD (1973) To the knowledge of wasps of the montaneous part of the of Chirchik Basin, Uzbekistan. Scientific works of Tashkent State University named after V.I. Lenin 378: 61–66. [In Russian]

Islamov ShD, Kazenas VL (1983) Digger wasps of the genus *Cerceris* of the mountainous regions of Uzbekistan. Uzbek Biological Journal 5: 44–46. [In Russian]

Islamov ShD (1986) Digger-wasps (Hymenoptera, Sphecidae) in the mountainous regions of Uzbekistan. Entomological Review 65: 513–534. [In Russian]

Islamov ShD (1989) Digger wasps of the genus *Sphex* in the mountainous regions of Uzbekistan. In: Nuritdinova F (Ed.) Issues of biology, ecology and regulation of the number of living creatures in the conditions of anthropogenic impact (Uzbekistan). Tashkent, 38–41. [In Russian]

Kazenas VL (1978) The digger wasps of Kazakhstan and Middle Asia (Hymenoptera, Sphecidae). The determinant. Nauka, Alma-Ata, 172 pp. [In Russian]

Kazenas VL (1984) The digger wasps *Cerceris* of Central Asia and Kazakhstan. Nauka, Alma Ata, 232 pp. [In Russian]

Kazenas VL, Antropov AV (1994) New species of the genus *Belomicrus* (Hymenoptera, Sphecidae) from the Asian part of Palearctic. 1. Species of the groups italicus and radoszkowskyi. Journal of Zoology 73(1): 68–77. [In Russian]

Kazenas VL (1995) Little known species of the genus *Mimesa*, group shestakovi (Hymenoptera, Sphecidae) from Kazakhstan. Selevinia 3(2): 26–29.

Kazenas VL (1998) Fauna of Kazakhstan. Vol. 9. Hymenoptera. Digger Wasps (Hymenoptera, Sphecidae) of Kazakhstan. Fascicle I. General characteristics of the family. Subfamilies Ampulicinae, Sphecinae. Institute of Zoology and Gene Pool of the Animal World, Almaty, 284 pp. [In Russian]

Kazenas VL (2001) Fauna and biology of sphecid wasps (Hymenoptera, Sphecidae) of Kazakhstan and Central Asia. Kazgos INTI, Almaty, 334 pp.

Kazenas VL (2002) A key to the identification of Cerceris Latreille (Hymenoptera, Sphecidae) of Kazakhstan and Middle Asia. Tethys Entomological Research 3: 105–124.

Kazenas VL (2002) Digger wasps (Hymenoptera, Sphecidae) of Kazakhstan. Tethys Entomological Research 4: 1–174.

Kohl FF (1888) Neue Hymenopteren in den Sammlungen Naturhistorischen Hofmuseums. Verhandlungen der kaiserlich-königlichen Zoologisch Botanischen Gesellschaft in Wien 38:133-156.

Kohl FF (1891) Zur Kenntnis der Hymenopteren-Gattung *Philanthus* Fabr. (sens. Lat). Annalen Naturhistorischen Hofmuseums 6: 345–370.

Kohl FF (1906) Die Hymenopterengruppe der Sphecinen. III. Monographie der Gattung Ammophila W. Kirby. (sens. Lat). Annalen Naturhistorischen Hofmuseums 21: 228– 382.

Kulumbetova TT (1999) Insects of the South Aral region. The Bulletin of the Karakalpak branch of the Academy of Sciences of the Republic of Uzbekistan 1(4): 62–69.

Malaise RA (1937) New insect-trap. Entomologisk tidskrift 58: 148–160.

Marshakov VG (1973) New species of *Lindenius* (Hymenoptera, Sphecidae) of the fauna of the USSR. Journal of Zoology 52(1): 1092–1094. [In Russian]

Marshakov VG (1976) Review of the genera of the tribe Crabronini (Hymenoptera, Sphecidae) from the USSR. The genus *Rhopalum* Stephens, 1829. Proceedings of the Zoological Institute of the USSR Academy of Sciences 67: 100–112. [In Russian]

Marshakov VG (1976) Digger wasps of the genera *Eremiasphecium* Kohl, *Ammoplanus* Gir., *Ammoplanops* Guss. and *Anomiopteryx* Guss. (Hymenoptera, Sphecidae) of the fauna of the USSR and Mongolia. Entomological Review 55: 668–682. [In Russian]

Melo GAR (1999) Phylogenetic relationships and classification of the major lineages of Apoidea (Hymenoptera), with Emphasis on the Crabronid Wasps. Scientific Papers of Natural History Museum. The University of Kansas 10(12): 1–55. https://doi.org/10.5962/bhl.title.4053

Mokrousov MV, Zryanin VA (2015) Materials on the early spring wasps and ants fauna of Uzbekistan (Hymenoptera: Vespomorpha: Chrysidoidea, Scolioidea, Pompiloidea, Vespoidea, Apoidea [Spheciformes], Formicoidea). Eversmannia. Entomological research in Russia and Neighboring Regions 5: 36–48. [In Russian]

Mokrousov MV, Gromenko VA (2015) To the knowledge of digger wasps fauna (Hymenoptera: Sphecidae, Crabronidae) of Uzbekistan. In: Euroasian Symposium on the webworms (III Symposium of SNG countries) (Novgorod), December 2015. Novgorod, 120–134. [In Russian]

Mokrousov M, Shlyakhtenok AS, Grebennikov KA (2016) New and little known Crabronid wasps (Hymenoptera; Crabronidae) from Russia. Far Eastern Entomologist 325: 18–32.

Mokrousov MV (2017) On the synonymy of two digger wasps (Hymenoptera: Sphecidae, Crabronidae) from the Oriental and Palearctic Regions. Far Eastern Entomologist 328: 35–36.

Mokrousov MV, Shorenko KI, Shlyakhtenok AS (2019) New data on on the Palaeartic digger wasps (Hymenoptera: Sphecidae, Crabronidae). Far Eastern Entomologist 396(2): 9–16.

https://doi.org/10.25221/fee.396.2

Mokrousov MV, Khedher HB (2020) Description of two new species of *Dinetus* Panzer, 1806 (Hymenoptera: Crabronidae: Dinetinae) with key to species. Zootaxa 4853(1):117–125. https://www.mapress.com/zt/article/view/zootaxa.4853.1.7

Mokrousov MV, Proshchalykin MYu, Aibek U (2020) Review of the Palaearctic species of Lestiphorus Lepeletier de Saint Fargeau (Hymenoptera: Crabronidae: Bembicinae). Far Eastern Entomologist 416(4): 18–28. https://doi.org/10.25221/fee.416.4

Nemkov PG (1990) Digger wasps of the tribe Gorytini (Hymenoptera, Sphecidae) of the fauna of the USSR. Genera *Gorytes* Latreille, *Pseudoplisus* Ashmead, *Kohlia* Handlirsch. Entomological Review 69: 675–690. [In Russian]

Nemkov PG (2009) Annotated catalogue of digger wasps (Hymenoptera; Sphecidae, Crabronidae) of Asian part of Russia. Dalnauka, Vladivostok, 193 pp.

Nemkov PG (2012) Digger wasps of the genus *Stizoides* Guérin-Méneville (Hymenoptera, Crabronidae, Bembecinae) of the fauna of Russia and neighboring countries. Far Eastern Entomologist 247: 8–13. https://www.biosoil.ru/FEE/Publication/373

Nemkov PG (2016) Digger wasps of the genus *Bembix* Fabricius, 1775 (Hymenoptera: Crabronidae, Bembicinae) of Russia and adjacent territories. Far Eastern Entomologist 313: 1–34.

Nurjanov AA, Medetov MZH, Gapparov FA, Kholmatov BR, Abdullayev II, Tufliyev NKh, Nurjonov FA (2023) Orthoptera (Insecta) fauna of the Kashkadarya region, Uzbekistan. Biodiversitas 1(24): 112–121. https://doi.org/10.13057/biodiv/d24115

Pulawski WJ (1965) Sur la synonymie de certains Sphecidae (Hym.) palearctiques. Polskie Pismo Entomologiczne 35: 563–578.

Pulawski WJ (1971) *Tachysphex* (Hym., Sphecidae) de la region palearctique occidentale et centrale. Panstwowe Wydawnictwo Naukowe, Wrocław, 464 pp.

Pulawski WJ (1973) Les *Ammatomus* A. Costa (Hym., Sphecidae) de la région palearctique occidentale et centrale. Polskie Pismo Entomologiczne 43: 273–288.

Pulawski WJ (1977) A revision of the Old World *Parapiagetia* Kohl (Hymymenoptera, Sphecidae). Polskie Pismo Entomologiczne 47: 601–669.

Pulawski WJ (1979) A revision of the World *Prosopigastra* Costa (Hymenoptera, Sphecidae). Polskie Pismo Entomologiczne 49: 3–134.

Pulawski WJ (1979) Two new synonyms in Transcaspian Sphecidae (Hymenoptera). Polskie Pismo Entomologiczne 49: 303–304.

Pulawski WJ (1983) Identification and Synonymies of Two Western Palearctic *Cerceris maculata* Radoszkowski and hathor n. sp. (Hymenoptera: Sphecidae). Pan-Pacific Enrtomologist 59(1-4): 240–245.

Pulawski WJ (2023) Catalog of Sphecidae sensu lato. California Academy of Sciences, Golden Gate Park, San Francisco, California, USA. Available from: https://www.calacademy.org/scientists/projects/catalog-of-sphecidae

Radoszkowski O (1877) Chrysidiformis, Mutillidae и Sphegidae in Voyage au Turkestan Papers of

Anthropology and Ethnography at the Imperial Moscow University 26: 1–87. [In Russian]

Radoszkowski O (1888) Etudes hymenopterologique. Horae Societatis Entomologicae Rossicae 22: 315–337.

Red Book of the Republic of Uzbekistan (2019) Vol. 2. Invertebrates. Chinor ENK, Tashkent, 374 pp.

Schmid-Egger Ch, Hauser M (2021) A new species of *Oryttus* Spinola, 1836 from the United Arab Emirates and Tunisia, with identification key to Palaearctic species (Hymenoptera, Crabronidae). Zootaxa 4908: 441–446. https://doi.org/10.11646/zootaxa.4908.3.9

Shestakov AV (1917) De duabus speciebus novis exoticis generis *Cerceris* Latr. (Hymenoptera, Crabronidae). Russian Entomological Review 16: 316–318.

Shestakov AV (1918) Materials for the wasp fauna of the genus *Cerceris* Latr. (Hymenoptera, Crabronidae). Yearbook of the Zoological Museum of the Russian Academy of Sciences. 22: 118–166. [In Russian]

Shestakov AV (1923) Review of Palearctic species oc of the new subgenus *Apiraptrix* Hymenoptera Crabronidae. Collection of Yaroslavl State University 2: 101–115.