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Research Article

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Faunistic and Zoogeographic Studies on the Family Coccinellidae (Coleoptera) of Ankara province (Turkey)

Ankara İli (Türkiye) Coccinellidae (Coleoptera) Familyası Üzerine Faunistik ve Zoocoğrafik Çalışmalar

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ABSTRACT

The main aim of this study is to determine the Coccinellidae fauna of Ankara. For this purpose, field studies were carried out in May-October 2018 and April-October 2019 in Ankara. 5310 specimens were collected. Totally 38 species belonging to 20 genera were identified. Faunal similarity and species diversity of districts of Ankara province are compared. The distribution of the species in the Palearctic Region, its subregions, and the geographical regions of Turkey were evaluated.

Key Words

Coccinellidae, faunistic composition, Ankara, Turkey.

ÖZ

Bu çalışmanın temel amacı, Ankara Coccinellidae faunasının belirlenmesidir. Bu amaçla Mayıs-Ekim 2018 ve Nisan-Ekim 2019 tarihlerinde Ankara'da arazi çalışmaları yapılmıştır. 5310 örnek toplanmıştır. Toplam 20 cinse ait 38 tür tespit edilmiştir. Ankara ili ilçelerinin fauna benzerlikleri ve tür çeşitliliği karşılaştırılmıştır. Türlerin Palaearktik Bölge, altbölgeleri ve Türkiye'nin coğrafik bölgelerindeki yayılışları değerlendirilmiştir.

Anahtar Kelimeler

Coccinellidae, faunistik kompozisyon, Ankara, Türkiye.

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INTRODUCTION

The family Coccinellidae, which is often called ladybirds or ladybugs, is represented by approximately 6000 species belonging to 360 genera and 42 tribes in the World [1, 2, 24, 30]. Except for a few phytophagous species that harm cultivated plants, members of the Coccinellidae family are known for their usefulness as they are predators. Approximately 68% of the Central European species are predators of aphids and 20% of scale insects [1]. Adults and larvae of most species feed on aphids, psyllids, mealybugs, or other small soft-bodied insects and mites. For this reason, it was explained in a lecture by Carl Linnaeus in 1752 that Coccinellidae family species can be used in biological control [1]. Giorgi et al. [30] published a paper on the evolution of food preferences of Coccinellidae including their role in biological control. In Turkey, many researchers were conducted important studies on this family. Günther [5] made a study named the results of the zoological expedition of the National Museum in Prague to Turkey. Giray [6] identified 37 species in the Aegean Region through the study of harmful and beneficial Coccinellidae (Coleoptera) species, gathering places, dates, and hosts, and 13 of these species are new records. Fürsch [7] contributed to the fauna of Turkey with his new Scymnini study from Turkey. Kreissl and Uygun [8] determined 11 species of the family Coccinellidae *Scymnus* in their study in Turkey. Uygun [1] determined 56 species belonging to Epilachninae and Coccinellinae subfamilies as a result of his taxonomic study on Turkey's Coccinellidae fauna. Özbek and Çetin [9] contributed to the Coccinellidae fauna from the Eastern Anatolia Region. Yasar et al. [10] reported that they found 23 species belonging to 15 genera belonging to the Coccinellidae family, which feed on cultivated plants and weeds and have important predatory species in their study in Van. Atlıhan and Özgökçe [11], in their study to determine the harmful and beneficial species in the sugar beet fields of Van province, determined 29 harmful and 31 beneficial species depending on different orders. Tezcan and Uygun [12] conducted a study in 1988-1999 to find and evaluate the Coccinellidae (Coleoptera) species found in ecological cherry production orchards in İzmir and Manisa regions. As a result of the study, 25 species belonging to 14 genera were determined. They reported that *Stethorus gilvifrons*, *Scymnus rubromaculatus,* and *Scymnus subvillus* species were more common among these species. Çetin and Alaoğlu [13] reported that 14 species belonging to the Coccinellidae family were detected in olive trees in Mut (Mersin) district. Özgen and Karsavuran, [14], in their study to determine the predatory Coccinellidae species, their hosts, and their densities in the Pistachio fields of Siirt province, detected 17 Coccinellidae species and the most common among these species were *Coccinella septempunctata* L. and *Oenopia (Synharmonia) conglobata* (L.). They reported that. Muştu and Kılınçer [15] reported that one of the most important factors limiting Coccinellidae populations is parasitoids in their study to investigate the parasitoids of Coccinellids and their importance in terms of biological control. Portakaldalı and Satar [16] identified 23 species belonging to 18 genera belonging to the Coccinellidae (Coleoptera) family in their study to determine the species belonging to the Coccinellidae (Coleoptera) family and to determine their distribution in the agricultural and non-agricultural areas of Artvin and Rize provinces. Among these species, *Coccinella septempunctata*, *Psyllobora viqintiduopunctata*, *Hyperaspis campestris*, *Propylea quatuordecimpunctata*, *Exochomus quadripustulatus*, *Adalia bipunctata,* and *Chilocorus renipustulatus* were reported to be the most common species. Bukejs and Telnov [29] reported *Harmonia axyridis* (Pallas, 1773) as a new record in their study in Turkey. According to the present literature, the Coccinellidae fauna of Turkey is represented by 35 genera, and 117 species (including 13 endemic species) [17]. The main purpose of this study is, by determining the faunistic composition of Ankara province, which contributed to the Coccinellidae fauna of Turkey.

MATERIALS and METHODS

Study Area

Ankara province has an area of 26,897 km² and 25 districts. Most of Ankara's area is located in the Central Anatolian region and the remaining part is located in the Black Sea region of Turkey [18]. Continental climate conditions prevail in the study area. Climate differences are observed throughout the province. The southern part has a distinctive steppe climate, which is a usual feature of the Central Anatolia climate, and the mild and rainy effect of the Black Sea climate is observed in the North [19].

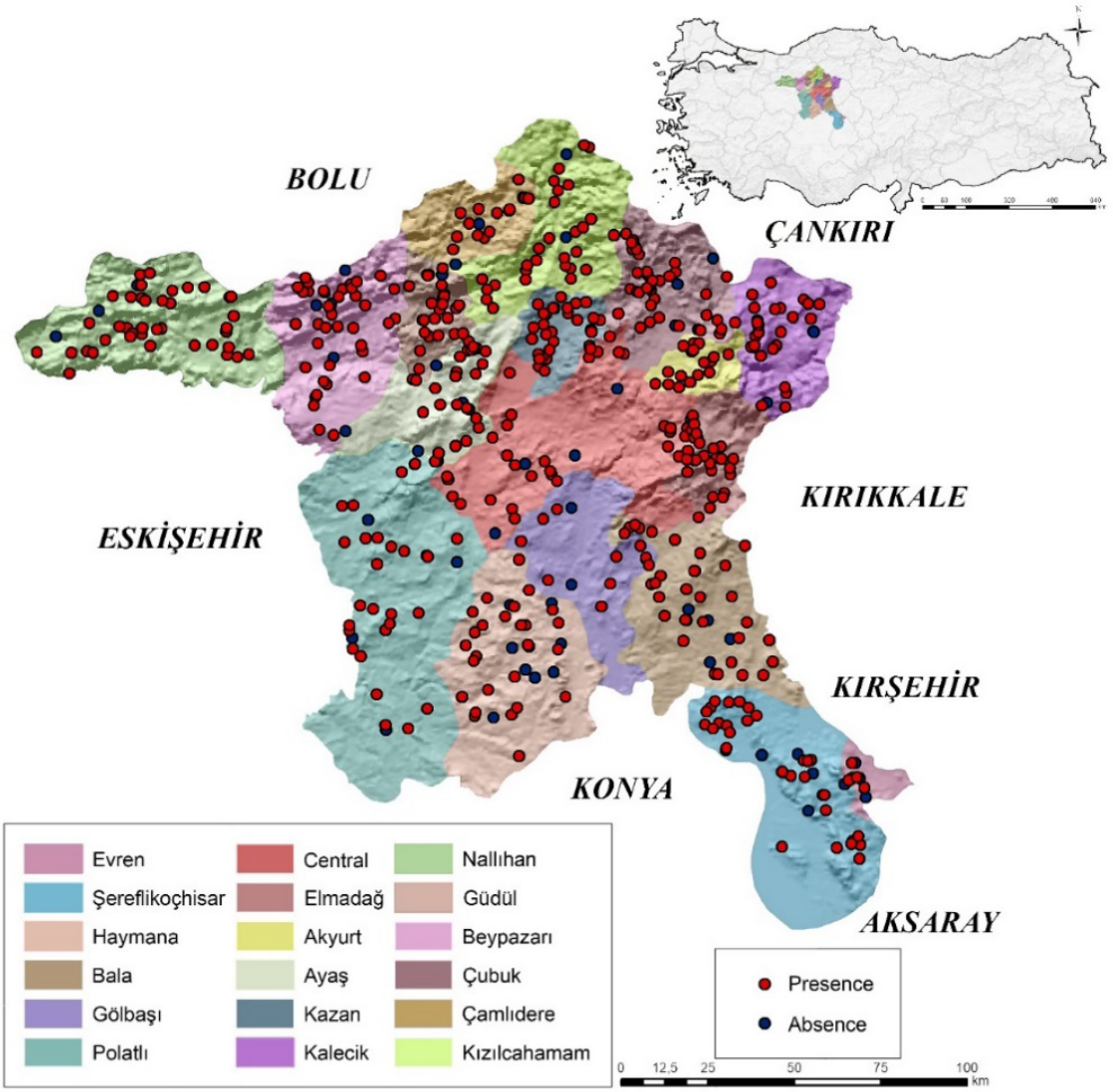

Figure 1. Map of Ankara province and collecting localities with presence/absence of specimens (from the Turkey General Directorate of Mapping [20] and designed with ArcGIS Pro 10.8 [21].

Field Studies

Within the scope of the study, specimens of the Coccinellidae family were collected, May-October (33 days) in 2018 and April-October in 2019 (36 days), with a total of 69 days (548 locations) of field study in Ankara province (Figure 1). Field studies have been carried out in a variety of possible habitats that may be suitable for the Coccinellidae family species. These habitats were randomly selected during the field study, and they are various suitable habitats such as creek-riverside, forested areas, road and field edges, meadows. Samples were collected by using direct (active) methods (insect net from riverside herbaceous vegetation, insect net from forest bottom herbaceous vegetation, insect net from road and field edge herbaceous vegetation, Japanese umbrella from trees and bushes, aspirator under stones and debris, aspirator over the plant) and indirect (passive) methods (pitfall traps and malaise trap). Details of the locations with examples are shown in Table 1.

In this study, 5310 specimens collected by field study were examined and identified to genus level and then species levels by separating male and female samples. The identification of the species is made with the taxonomic keys and definitions in the relevant literature [1, 2, 23, 24]. The diagnoses are supported by comparing the male genitalia with the drawings in the available literature.

Species diversity of the districts was evaluated using the Brillouin diversity index [25]. Brillouin diversity index, which is recommended and used in cases where ecological randomness is not fully achieved and in studies on collection materials, was considered to be more suitable for this study than other diversity indices. This analysis was made using the software of Past 3.25 [26]. The districts where the urbanization is intense and around the centre (Altındağ, Çankaya, Etimesgut, Keçiören, Mamak, Pursaklar, Sincan, Yenimahalle) are evaluated as the Central District. Faunal similarities between districts of Ankara province were compared with the Baroni-Urbani Buser index [27]. The reason for choosing is that it is considered a better comparison indicator than Sørensen, Jaccard, etc. indexes with its evaluation of both presence and absence in faunas. This analysis was done using MVSP 3.21 (MultiVariate Statistical Package 3.21) software [28].

Within the scope of zoogeographic evaluations, the distribution of the identified species in the subregions of the Palaearctic Region and their distribution in the geographical regions of Turkey were discussed. Since the distribution of the species in the Palaearctic Region is given according to the country borders in the current literature [17], the Palaearctic Region is divided into 9 subregions according to the country borders. These subregions are Southern Europe (Albania, Andorra, Azores, Bosnia and Herzegovina, Croatia, Greece, Italy, Macedonia, Malta, Portugal, Spain, Slovenia, Serbia and Montenegro), Western Europe (Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Netherlands, Switzerland), Northern Europe (Denmark, Estonia, Faroe Islands, Finland, Great Britain, Iceland, Ireland, Latvia, Lithuania, Norway, Svalbard, Sweden), Eastern Europe (Armenia, Azerbaijan, Belarus, Bulgaria, Czech Republic, Georgia, Hungary, Kazakhstan, Moldova, Romania, Russia, Poland, Slovakia, Ukraine), Siberia (Russia: East / West Siberia), Middle East (Arab Emirates, Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Cyprus, Saudi Arabia, Egypt (Sinai peninsula), Syria, Yemen), Central Asia (Afghanistan, Bhutan, China, India (Arunachal Pradesh, Himachal Pradesh, Kashmir, Sikkim, Uttarakhand), Kazakhstan, Kyrgyzstan, Korea, Mongolia, Nepal, Pakistan, Uzbekistan, Turkmenistan, Tajikistan), Far East Asia (Russia (Far East), Japan) and North Africa (Algeria, Canary Islands, Egypt, Libya, Morocco, Madeira Archipelago, Tunisia).

Table 1. Figure-of-merit (FOM) calculation of the sensor at different glycerol concentrations (FWHM represents full width at half maximum of the curves).

Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)
		Lat. (N)	Long. (E)				Lat. (N)	Long. (E)				Lat. (N)	Long. (E)				Lat. (N)	Long. (E)	
1	13.05.2018	39.738206	32.347339	754.7	**28**	23.05.2018	39.938883	32.402667	993.7	**55**	12.06.2018	39.242139	32.719014	1144.8	**82**	26.06.2018	39.345225	33.411303	1034.1
2	13.05.2018	39.757828	32.320431	787.4	**29**	23.05.2018	39.903117	32.362233	865.3	**56**	12.06.2018	39.085017	32.567908	1099.5	**83**	26.06.2018	39.718350	33.152103	915.4
3	13.05.2018	39.800372	32.302422	806.1	**30**	23.05.2018	39.889917	32.324667	888.5	**57**	12.06.2018	39.210811	32.555992	1279.8	**84**	26.06.2018	39.658775	33.073178	968.6
4	13.05.2018	39.847336	32.257283	778.8	**31**	23.05.2018	40.081717	32.321533	941.2	**58**	12.06.2018	39.480267	32.831997	1294.8	**85**	26.06.2018	39.672692	32.905064	1437.2
5	13.05.2018	39.839136	32.191528	861.5	**32**	23.05.2018	40.138967	32.355650	910.1	**59**	12.06.2018	39.540494	32.860194	1063.1	**86**	27.06.2018	40.083133	32.501072	911.2
6	13.05.2018	39.816267	32.145978	978.3	**33**	23.05.2018	40.183200	32.339617	1016.5	**60**	13.06.2018	40.333700	32.701800	971	**87**	27.06.2018	40.135200	32.598139	856
7	13.05.2018	39.642319	32.030894	727.5	**34**	23.05.2018	40.330717	32.213433	1289.8	**61**	13.06.2018	40.357181	32.752475	1044	**88**	27.06.2018	40.174572	32.573494	1026.5
8	13.05.2018	39.446111	32.125322	826.2	**35**	23.05.2018	40.278500	32.271950	994.4	**62**	13.06.2018	40.360986	32.699689	1046.8	**89**	27.06.2018	40.204511	32.578211	1087.6
9	16.05.2018	40.220500	32.242167	685.3	**36**	30.05.2018	40.064017	32.997367	971	**63**	13.06.2018	40.367000	32.682433	1021.2	**90**	27.06.2018	40.241297	32.613106	1074.4
10	16.05.2018	40.078317	32.387050	1097.5	**37**	30.05.2018	40.063433	33.040567	1042.3	**64**	13.06.2018	40.532144	32.639114	1297.2	**91**	27.06.2018	40.265356	32.591328	1269.6
11	18.05.2018	39.168214	33.214306	1029.5	**38**	30.05.2018	40.056350	33.077017	1130.1	**65**	13.06.2018	40.562106	32.651269	1096.9	**92**	27.06.2018	40.541831	32.530747	1359.3
12	18.05.2018	39.182417	33.234683	981.2	**39**	30.05.2018	40.137367	33.194783	1311.9	**66**	13.06.2018	40.681408	32.735836	1615	**93**	27.06.2018	40.588892	32.514461	1398.7
13	18.05.2018	39.238517	33.302017	1241.1	**40**	30.05.2018	40.166300	33.320633	1088	**67**	13.06.2018	40.540003	32.550042	1305.1	**94**	27.06.2018	40.451175	32.420886	1104.9
14	18.05.2018	39.203961	33.358425	946.3	**41**	30.05.2018	40.193300	33.332617	1045.6	**68**	25.06.2018	40.110500	31.615233	475.5	**95**	28.06.2018	39.950706	33.107786	1128.4
15	18.05.2018	39.089919	33.521206	936.2	**42**	30.05.2018	40.229500	33.338233	1000.9	**69**	25.06.2018	40.168461	31.535139	741.5	**96**	28.06.2018	39.930261	33.101675	1174.2
16	18.05.2018	39.088350	33.534167	945.9	**43**	30.05.2018	40.267867	33.327117	995.9	**70**	25.06.2018	40.209247	31.558106	975.5	**97**	28.06.2018	39.940611	33.048942	1087
17	18.05.2018	39.085150	33.682933	931.9	**44**	11.06.2018	40.141428	32.889311	1011.9	**71**	25.06.2018	40.257461	31.541889	1361.3	**98**	28.06.2018	39.982972	33.125611	1107.4
18	18.05.2018	39.047633	33.699600	1036.3	**45**	11.06.2018	40.185156	32.838686	1168.5	**72**	25.06.2018	40.280894	31.454906	922	**99**	28.06.2018	39.945706	33.122564	1131.6
19	18.05.2018	38.863167	33.453350	931.3	**46**	11.06.2018	40.303797	32.927678	1120.4	**73**	25.06.2018	40.166142	31.299917	729.6	**100**	28.06.2018	39.926897	33.131753	1201.3
20	19.05.2018	40.191033	31.914267	757.7	**47**	11.06.2018	40.312192	32.966831	1242.6	**74**	25.06.2018	40.154064	31.249467	1069.5	**101**	28.06.2018	39.872844	33.226753	1149.1
21	19.05.2018	40.268583	31.913350	1048.6	**48**	11.06.2018	40.352719	32.927678	1120.8	**75**	25.06.2018	40.134150	31.126467	686.2	**102**	28.06.2018	39.831867	33.256703	876.1
22	19.05.2018	40.288450	31.925950	1226.4	**49**	11.06.2018	40.413936	32.910394	1554.8	**76**	25.06.2018	40.102456	31.066169	787.9	**103**	28.06.2018	39.771881	33.233508	954.8
23	19.05.2018	40.291933	31.956333	1437	**50**	11.06.2018	40.431017	32.905758	1540.6	**77**	26.06.2018	39.688203	32.919939	1256.7	**104**	28.06.2018	39.771881	33.199725	964.8
24	19.05.2018	40.302850	31.953333	1579.5	**51**	11.06.2018	40.449300	32.845017	1468.4	**78**	26.06.2018	39.688531	32.954533	1174.6	**105**	29.06.2018	39.629983	31.961997	688.6
25	19.05.2018	40.271933	31.970433	1498.6	**52**	12.06.2018	39.545594	32.649969	1146.6	**79**	26.06.2018	39.610714	32.977494	1018.6	**106**	29.06.2018	39.457878	32.064492	746.8
26	19.05.2018	40.059228	32.173242	606.1	**53**	12.06.2018	39.468547	32.668756	1223.5	**80**	26.06.2018	39.564339	33.027661	1019	**107**	29.06.2018	39.399636	31.985392	711.2
27	23.05.2018	39.975500	32.509800	800.6	**54**	12.06.2018	39.434281	32.688925	1149.4	**81**	26.06.2018	39.512808	33.270083	963.7	**108**	29.06.2018	39.352281	31.998989	723.5

Table 1. (Continued)

Locality Code	Date	Coordinates (°)w		Altitude (m)
		Lat. (N)	Long. (E)	
109	29.06.2018	39.234644	32.085011	821.3
110	29.06.2018	39.148992	32.195192	852.3
111	29.06.2018	39.201225	32.254786	803.4
112	29.06.2018	39.450050	32.217511	998
113	19.07.2018	39.058161	33.449656	1077.4
114	19.07.2018	39.046083	33.525083	1068.4
115	19.07.2018	39.091417	33.543639	960
116	19.07.2018	38.999500	33.590250	1046.1
117	19.07.2018	39.039806	33.671667	1355.8
118	19.07.2018	39.018889	33.725083	1040.8
119	19.07.2018	38.892806	33.707944	1104.1
120	19.07.2018	39.211222	33.192139	1083.4
121	20.07.2018	40.145583	31.848472	649.6
122	20.07.2018	40.195889	31.847583	921
123	20.07.2018	40.194222	31.769583	866.7
124	20.07.2018	40.081417	31.808639	498.1
125	20.07.2018	40.047472	31.872250	641.5
126	20.07.2018	40.011722	31.850250	922.8
127	20.07.2018	39.982417	31.841500	1023.5
128	20.07.2018	39.908667	31.912361	1042.2
129	21.07.2018	39.995306	32.268361	794.8
130	21.07.2018	39.974306	32.212222	828.5
131	21.07.2018	40.056861	32.186333	612.9
132	21.07.2018	40.135028	32.195583	921.3
133	21.07.2018	40.350806	32.262972	1346
134	21.07.2018	40.307250	32.261556	1495
135	21.07.2018	40.222111	32.285944	824.7
136	21.07.2018	40.248389	32.313750	949.6
137	22.07.2018	40.151667	33.117639	1217
138	22.07.2018	40.173139	33.134333	1332.8
139	22.07.2018	40.162500	33.393917	983.9
140	22.07.2018	40.206417	33.419583	912.6
141	22.07.2018	40.265639	33.398111	939.3
142	22.07.2018	40.280528	33.549194	742.9
143	22.07.2018	40.242222	33.521472	747.9
144	22.07.2018	40.229306	33.263417	1433.5
145	23.07.2018	40.217222	33.072500	990
146	23.07.2018	40.211694	33.217306	1171.7
147	23.07.2018	40.246694	33.166583	1005.3
148	23.07.2018	40.301611	33.162722	1216.9
149	23.07.2018	40.380694	33.054722	1227.5
150	23.07.2018	40.333000	32.979917	1352.7
151	23.07.2018	40.420500	32.918833	1535.9
152	24.07.2018	40.251944	32.439861	1268
153	24.07.2018	40.273528	32.416500	1158.6
154	24.07.2018	40.299139	32.417028	773.5
155	24.07.2018	40.676714	32.752028	1726.1
156	25.07.2018	39.517722	32.586972	1226.9
157	25.07.2018	39.494361	32.446167	969.2
158	25.07.2018	39.457472	32.399222	1120.6
159	25.07.2018	39.404500	32.408056	1048.2
160	25.07.2018	39.235639	32.370778	906.6
161	25.07.2018	39.194528	32.418556	1038.8
162	25.07.2018	39.254833	32.458000	978.6
163	26.07.2018	39.530222	33.115333	1284.2
164	26.07.2018	39.507500	33.023722	1281.2
165	26.07.2018	39.459056	33.043472	1125.8
166	26.07.2018	39.448722	33.118417	962.6
167	26.07.2018	39.594694	33.246917	1129.7
168	26.07.2018	39.654778	33.330972	1252.9
169	26.07.2018	39.578556	33.141861	1164.2
170	4.08.2018	40.132667	31.489361	593.2
171	4.08.2018	40.236333	31.342361	660.9
172	4.08.2018	40.246500	31.244139	1002.3
173	4.08.2018	40.247500	31.206250	1038.5
174	4.08.2018	40.248722	31.146639	1386.1
175	4.08.2018	40.170722	31.171278	742.6
176	4.08.2018	40.129000	31.430417	537.3
177	5.08.2018	40.129861	32.614528	847.6
178	5.08.2018	40.186528	32.623278	920.2
179	5.08.2018	40.195694	32.776028	1077
180	5.08.2018	40.159417	32.771083	1281.3
181	5.08.2018	40.144333	32.798250	1252.3
182	5.08.2018	40.144778	32.869500	1037.2
183	28.08.2018	39.751381	32.449447	816.9
184	28.08.2018	39.729708	32.521694	1120.9
185	28.08.2018	39.705275	32.531372	1212
186	28.08.2018	39.647575	32.339878	951
187	28.08.2018	39.599086	32.242644	967.9
188	28.08.2018	39.419589	32.121522	936.8
189	29.08.2018	39.117942	33.261417	949.8
190	29.08.2018	39.175814	33.261492	951.2
191	29.08.2018	39.223861	33.332569	999.1
192	29.08.2018	39.189694	33.328714	972.9
193	29.08.2018	38.959097	33.597094	1004.2
194	29.08.2018	38.880714	33.687047	1057.1
195	29.08.2018	38.892789	33.707878	1102.9
196	30.08.2018	39.904761	33.223636	1204.9
197	30.08.2018	39.899653	33.197706	1148.1
198	30.08.2018	39.866983	33.135106	1402.4
199	30.08.2018	39.860433	33.187967	1364.4
200	18.09.2018	40.129419	32.000253	553.9
201	18.09.2018	40.187606	31.873681	616.7
202	18.09.2018	40.279278	31.808433	1561
203	18.09.2018	40.302408	31.807092	1365.6
204	18.09.2018	40.314864	31.798053	1237
205	18.09.2018	40.289736	31.772892	1226.1
206	18.09.2018	40.278283	31.792381	1289.6
207	19.09.2018	39.868111	32.500250	906.9
208	19.09.2018	39.947422	32.497322	775
209	19.09.2018	39.914786	32.450900	787.4
210	19.09.2018	39.963831	32.393517	1165.2
211	19.09.2018	39.988219	32.359261	1051.3
212	19.09.2018	40.087592	32.195219	695.8
213	19.09.2018	40.173767	32.225708	1068.1
214	19.09.2018	40.215311	32.207081	1221.9
215	19.09.2018	40.302108	32.152553	654.7
216	19.09.2018	40.333222	32.212767	1272.2

Table 1. (Continued)

Locality Code	Date	Coordinates (°)w		Altitude (m)
		Lat. (N)	Long. (E)	
217	19.09.2018	40.244958	32.257678	684.7
218	20.09.2018	40.122506	33.161139	1151
219	20.09.2018	40.096892	33.179544	1394.9
220	20.09.2018	40.142608	33.353128	1098.8
221	20.09.2018	40.062172	33.436131	684.7
222	20.09.2018	40.046144	33.443022	648.8
223	20.09.2018	40.009567	33.439175	652.8
224	20.09.2018	40.013064	33.358931	1351.8
225	21.09.2018	39.842647	32.528222	1124.3
226	21.09.2018	39.815547	32.584578	1113.6
227	21.09.2018	39.855242	32.628878	1019.1
228	21.09.2018	39.829489	32.647317	1015.7
229	21.09.2018	39.821644	32.653317	1013
230	21.09.2018	39.804989	32.672347	1153.4
231	11.10.2018	40.456528	32.713611	1238
232	11.10.2018	40.468836	32.738372	1287.1
233	11.10.2018	40.491328	32.765283	1478.8
234	11.10.2018	40.437858	32.623597	1347.8
235	11.10.2018	40.541069	32.538567	1339.2
236	11.10.2018	40.500797	32.444275	1249.9
237	11.10.2018	40.509244	32.380650	1280
238	11.10.2018	40.497994	32.319731	1244.2
239	12.10.2018	39.731553	32.675233	1163.5
240	12.10.2018	39.705861	32.628633	1156.3
241	12.10.2018	39.645108	32.554417	1233.7
242	12.10.2018	39.597986	32.549819	1156.4
243	12.10.2018	39.425706	32.576983	1238.5
244	12.10.2018	39.366092	32.690558	1171
245	12.10.2018	39.612156	32.878164	1155
246	13.10.2018	40.355881	33.057439	1283.4
247	13.10.2018	40.345567	33.036628	1161.9
248	13.10.2018	40.333556	33.003536	1255.8
249	13.10.2018	40.237742	33.004244	1030
250	13.10.2018	40.225733	32.974242	1079.6
251	13.10.2018	40.211336	32.942703	1236.8
252	20.04.2019	39.058117	33.448600	1065.7
253	20.04.2019	39.048783	33.479117	1148.8
254	21.04.2019	39.376256	32.588242	1117.7
255	22.04.2019	39.996767	32.325703	977.7
256	22.04.2019	39.902917	32.362217	864.5
257	22.04.2019	39.870500	32.268533	758.6
258	22.04.2019	40.037883	32.249817	706.6
259	22.04.2019	40.273783	32.268767	939.5
260	7.05.2019	40.101908	31.577481	561.3
261	7.05.2019	40.107069	31.541997	589
262	7.05.2019	40.126636	31.544764	617.8
263	7.05.2019	40.177778	31.536286	783.6
264	7.05.2019	40.258758	31.546925	1368.8
265	7.05.2019	40.278894	31.399817	780.1
266	7.05.2019	40.170072	31.315442	668.2
267	7.05.2019	40.123089	31.279544	974.4
268	23.05.2019	39.695233	32.938667	1173.7
269	23.05.2019	39.678883	32.996817	1050.1
270	23.05.2019	39.641650	32.958583	1111.1
271	23.05.2019	39.608167	32.978767	1014
272	23.05.2019	39.592033	32.988517	987.5
273	23.05.2019	39.541483	32.997933	1197.8
274	23.05.2019	39.543933	33.011083	1165.5
275	23.05.2019	39.578500	33.143367	1166.9
276	23.05.2019	39.626050	33.160717	1089.8
277	24.05.2019	40.434472	32.402611	1048.2
278	24.05.2019	40.440889	32.381028	1088.5
279	24.05.2019	40.470722	32.350861	1028.4
280	24.05.2019	40.510694	32.486750	1330.5
281	24.05.2019	40.379306	32.583000	888.6
282	24.05.2019	40.352778	32.547222	862
283	24.05.2019	40.327306	32.546611	1008.5
284	25.05.2019	40.249917	32.004500	1075.4
285	25.05.2019	40.269583	32.975750	1153.8
286	25.05.2019	40.285889	32.987833	1213
287	25.05.2019	40.308694	32.974694	1267
288	25.05.2019	40.400528	32.931306	1342.6
289	25.05.2019	40.413667	32.923444	1432.3
290	25.05.2019	40.454750	32.886722	1369.2
291	25.05.2019	40.438528	32.910417	1317.5
292	26.05.2019	39.949306	33.050806	1010.2
293	26.05.2019	39.901389	33.218528	1233.3
294	26.05.2019	39.874917	33.207611	1299.5
295	26.05.2019	39.840556	33.193444	1300.6
296	26.05.2019	39.848667	33.255500	875
297	26.05.2019	39.783528	33.238083	865.1
298	26.05.2019	39.743778	33.191028	897.3
299	26.05.2019	39.873333	33.265611	944
300	18.06.2019	40.190167	31.913944	766.9
301	18.06.2019	40.222667	31.892194	850.3
302	18.06.2019	40.238000	31.887139	940.8
303	18.06.2019	40.243556	31.881194	1014.6
304	18.06.2019	40.278417	31.866083	1422.6
305	18.06.2019	40.284083	31.862333	1421.2
306	18.06.2019	40.188944	31.966750	738.3
307	19.06.2019	39.611444	32.162222	930.2
308	19.06.2019	39.621639	32.118389	957.4
309	19.06.2019	39.644028	32.070750	784.4
310	19.06.2019	39.726000	31.985750	677.7
311	19.06.2019	39.724139	31.949167	671
312	19.06.2019	39.575306	32.072167	800.6
313	19.06.2019	39.600750	32.238750	957.4
314	20.06.2019	40.102861	32.599778	839.3
315	20.06.2019	40.121806	32.601833	848.8
316	20.06.2019	40.146806	32.636278	845
317	20.06.2019	40.244194	32.695500	911.7
318	20.06.2019	40.226417	32.728361	903.7
319	21.06.2019	40.096417	33.038083	998.1
320	21.06.2019	40.086222	33.082167	1092.7
321	21.06.2019	40.069528	33.115667	1252.4
322	21.06.2019	40.170833	33.330250	1087
323	21.06.2019	40.193139	33.332583	1045.7
324	21.06.2019	40.203750	33.343000	1039.9

Table 1. (Continued)

Locality Code	Date	Coordinates (°)w		Altitude (m)
		Lat. (N)	Long. (E)	
325	21.06.2019	40.223389	33.343000	1032.8
326	21.06.2019	40.268528	33.418056	976.7
327	27.06.2019	40.104444	32.409444	1033
328	27.06.2019	40.139000	32.418611	1035.4
329	27.06.2019	40.146361	32.387722	919.8
330	27.06.2019	40.143056	32.378750	884.5
331	27.06.2019	40.163917	32.359778	1023.3
332	27.06.2019	40.182222	32.309889	1105
333	27.06.2019	40.258028	32.267333	712.1
334	27.06.2019	40.256667	32.323861	956.8
335	28.06.2019	39.177917	33.188861	1077.5
336	28.06.2019	39.222694	33.205111	1198.2
337	28.06.2019	39.239417	33.220583	1270.3
338	28.06.2019	39.237222	33.266028	1307.9
339	28.06.2019	39.158222	33.271167	928.9
340	28.06.2019	39.045583	33.685583	1168.3
341	29.06.2019	39.426056	32.562694	1278.3
342	29.06.2019	39.372278	32.591583	1118.8
343	29.06.2019	39.291806	32.544778	1044.4
344	29.06.2019	39.192000	32.539667	1200.4
345	29.06.2019	39.341917	32.415250	1183.7
346	30.06.2019	40.268833	31.347111	691.7
347	30.06.2019	40.311611	31.267583	782.8
348	30.06.2019	40.307556	31.236222	813.4
349	30.06.2019	40.279611	31.241306	1141.6
350	30.06.2019	40.169361	31.249278	948.9
351	30.06.2019	40.153917	31.217611	945.9
352	30.06.2019	40.146028	31.210278	959.2
353	23.07.2019	40.387472	32.678667	1045.6
354	23.07.2019	40.403750	32.718472	1118.2
355	23.07.2019	40.577083	32.685500	1233
356	23.07.2019	40.619917	32.651639	1165.5
357	23.07.2019	40.586944	32.636750	1365.2
358	24.07.2019	39.962083	33.131750	1115.1
359	24.07.2019	39.937139	33.140722	1211.1
360	24.07.2019	39.925389	33.144611	1241.2
361	24.07.2019	39.912444	33.151250	1425.6
362	24.07.2019	39.890750	33.112028	1446.7
363	24.07.2019	39.835722	33.111694	1619.4
364	24.07.2019	39.955333	33.029917	1117.7
365	25.07.2019	39.450083	33.115306	964.3
366	25.07.2019	39.394861	33.108722	965.3
367	25.07.2019	39.310111	33.227528	906.2
368	25.07.2019	39.309528	33.310694	931.7
369	25.07.2019	39.309833	33.380722	836.6
370	25.07.2019	39.401722	33.397944	747.3
371	26.07.2019	40.227500	32.803028	951.9
372	26.07.2019	40.245583	32.864750	979
373	26.07.2019	40.309389	32.905833	1269
374	26.07.2019	40.301583	32.935472	1067.3
375	26.07.2019	40.313111	32.962083	1216.7
376	26.07.2019	40.347250	32.963250	1368.9
377	26.07.2019	40.319194	32.970556	1310.1
378	27.07.2019	39.465417	32.020028	733.5
379	27.07.2019	39.412528	31.985417	706.5
380	27.07.2019	39.400278	31.985194	710
381	27.07.2019	39.333333	32.026611	730
382	27.07.2019	39.155472	32.116972	908.3
383	27.07.2019	39.403750	32.108333	926
384	28.07.2019	40.165361	33.089583	1082.2
385	28.07.2019	40.172472	33.123667	1287.1
386	28.07.2019	40.172000	33.142944	1308.5
387	28.07.2019	40.154917	33.123111	1251.1
388	28.07.2019	40.170889	33.405111	952.4
389	28.07.2019	40.245056	33.460306	863.8
390	28.07.2019	40.280750	33.511806	819.3
391	28.07.2019	40.291750	33.496472	832.2
392	29.07.2019	40.144056	31.995167	579.4
393	29.07.2019	40.205111	32.086556	695.2
394	29.07.2019	40.216444	32.107917	759.8
395	29.07.2019	40.293278	32.102750	868.1
396	29.07.2019	40.327111	32.052444	1005.5
397	29.07.2019	40.309611	31.972203	1362.4
398	29.07.2019	40.268694	31.913056	1052.6
399	30.07.2019	40.090889	32.620194	838.9
400	30.07.2019	40.2562500	32.6931111	921.3
401	30.07.2019	40.269917	32.720806	999.5
402	30.07.2019	40.273500	32.754861	1118.5
403	30.07.2019	40.233167	32.780722	926.8
404	30.07.2019	40.151750	32.773583	1273.6
405	30.07.2019	40.128833	32.769000	1111.9
406	27.08.2019	39.112611	33.260111	985.2
407	27.08.2019	38.862333	33.634361	1024.8
408	27.08.2019	38.834472	33.711722	1141
409	27.08.2019	38.873028	33.684667	1097.2
410	27.08.2019	38.870750	33.713917	1076.9
411	27.08.2019	38.893194	33.707639	1102.2
412	27.08.2019	39.019972	33.725000	1037.9
413	27.08.2019	39.047639	33.699333	1036.9
414	28.08.2019	40.070472	32.318806	909
415	28.08.2019	40.122000	32.331472	975.3
416	28.08.2019	40.141333	32.370028	868.7
417	28.08.2019	40.149667	32.376250	1049.1
418	28.08.2019	40.176306	32.254833	993.2
419	28.08.2019	40.259611	32.229972	903.2
420	28.08.2019	40.215750	32.201750	654.7
421	28.08.2019	40.182889	32.210028	948.2
422	29.08.2019	39.474361	32.537667	1099.9
423	29.08.2019	39.447472	32.508417	1163.7
424	29.08.2019	39.423056	32.433889	1158
425	29.08.2019	39.370639	32.378528	966
426	29.08.2019	39.235583	32.370750	906.6
427	29.08.2019	39.185278	32.416361	985.2
428	29.08.2019	39.330722	32.408000	1143.5
429	30.08.2019	40.242556	31.315250	726.5
430	30.08.2019	40.239833	31.255417	915.6
431	30.08.2019	40.248972	31.146194	1391.8
432	30.08.2019	40.176361	31.070889	1079.2

Table 1. (Continued)

Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)	Locality Code	Date	Coordinates (°)w		Altitude (m)
		Lat. (N)	Long. (E)				Lat. (N)	Long. (E)				Lat. (N)	Long. (E)				Lat. (N)	Long. (E)	
433	30.08.2019	40.093806	30.897083	336	**445**	3.09.2019	40.234944	33.203583	1297.9	**457**	5.09.2019	39.342389	33.272667	831.6	**469**	26.10.2019	40.089167	31.891417	490.8
434	30.08.2019	40.096167	31.012639	807.4	**446**	3.09.2019	40.347611	33.232000	880.8	**458**	5.09.2019	39.406111	33.295222	848.2	**470**	26.10.2019	40.039528	31.882556	766.7
435	30.08.2019	40.098639	31.086333	700.6	**447**	3.09.2019	40.332000	32.974889	1328.2	**459**	5.09.2019	39.447056	33.321500	779.4	**471**	26.10.2019	39.920361	31.862556	1062.4
436	30.08.2019	40.167056	31.198306	755	**448**	3.09.2019	40.356222	32.959833	1247	**460**	6.09.2019	39.838944	32.189583	861.5	**472**	26.10.2019	39.989722	31.020083	1316.4
437	31.08.2019	40.434944	32.309778	1071.4	**449**	4.09.2019	39.878639	33.166389	1233.4	**461**	6.09.2019	39.808778	32.300194	790.3	**473**	26.10.2019	40.060056	32.010056	894.4
438	31.08.2019	40.401111	32.297333	1045.4	**450**	4.09.2019	39.869028	33.138139	1375.5	**462**	25.10.2019	40.069667	33.114028	1262.5	**474**	27.10.2019	40.122361	32.626806	833.8
439	31.08.2019	40.325944	32.400167	981.5	**451**	4.09.2019	39.869806	33.109278	1514	**463**	25.10.2019	40.089361	33.141889	1237.6	**475**	27.10.2019	40.169083	32.648917	868.2
440	31.08.2019	40.311194	32.444944	783.7	**452**	4.09.2019	39.876139	33.081111	1304	**464**	25.10.2019	40.125639	33.184306	1216.3	**476**	27.10.2019	40.193806	32.640361	926.2
441	31.08.2019	40.364667	32.550806	955.5	**453**	4.09.2019	39.901806	33.043583	1084.9	**465**	25.10.2019	40.145333	33.243389	1178.2	**477**	27.10.2019	40.212056	32.613944	964.5
442	31.08.2019	40.410056	32.590028	1272.1	**454**	5.09.2019	39.510500	33.163778	965.5	**466**	25.10.2019	40.234556	33.337833	994.4	**478**	27.10.2019	40.240444	32.621472	1062.8
443	3.09.2019	40.206528	33.147556	1121.9	**455**	5.09.2019	39.446222	33.174306	1193.6	**467**	25.10.2019	40.302250	33.320500	897.7	**479**	27.10.2019	40.255889	32.644667	1091.8
444	3.09.2019	40.199222	33.212083	1324.6	**456**	5.09.2019	39.311111	33.216806	914	**468**	25.10.2019	40.333556	33.381194	765	**480**	27.10.2019	40.284361	32.670750	1059.1

RESULTS and DISCUSSION

This study identified 38 species belonging to 20 genera among 5310 specimens collected in field studies. Codes of 480 visited localities are shown in Table 2.

Within this study, field studies were carried out in 548 locations, and specimens belonging to this family were collected in 480 locations. Considering the localities, presence, and prevalence of the species, the most common species is *Coccinella septempunctata* with 58.94%. This species is followed by *Coccinula quatuordecimpustulata* with 41.61% and *Hippodamia variegata* with 41.42%. The least common species are *Scymnus flagellisiphonatus* and *Exochomus undulatus* with 0.18% (Table 2).

Table 2. The codes of the localities of sampling.

Species	Locality Code
Hyperaspis histeroides Falderman, 1837	11, 110
Hyperaspis quadrimaculata Redtenbacher, 1843	5, 38, 80, 100, 116, 117, 132, 135, 137, 139, 140, 141, 154, 196, 274, 331, 381, 386, 388, 400
Hyperaspis reppensis (Herbst, 1783)	11, 150, 212, 221, 431
Nephus (Bipunctatus) nigricans Weise, 1879	170, 189, 192, 211, 263, 395, 409
Scymnus (Mimopullus) flagellisiphonatus (Fürsch, 1970)	230
Scymnus (Mimopullus) pharaonis Motschulsky, 1851	88, 230
Scymnus (Pullus) auritus Thunberg, 1795	70, 88
Scymnus (Pullus) subvillosus (Goeze, 1777)	188, 214, 215, 217, 429, 468, 473
Scymnus (s.str.) apetzi (Mulsant, 1846)	33, 47, 64, 78, 81, 83, 87, 101, 119, 138, 139, 152, 153, 176, 183, 189, 199, 225, 359, 384, 402, 418, 443
Scymnus (s.str.) bivulnerus Baudi di Selve, 1894	1, 11, 27, 37, 55, 80, 81, 82, 83, 86, 87, 95, 100, 101, 102, 105, 107, 108, 109, 114, 116, 129, 131, 132, 135, 139, 141, 146, 156, 158, 159, 161, 163, 177, 184, 185, 188, 189, 194, 195, 198, 218, 227, 274, 292, 298, 333, 343, 359, 364, 367, 389, 399, 402, 406, 407, 409, 410, 411, 414, 417, 418, 426, 453, 455, 458
Scymnus (s.str.) frontalis (Fabricius, 1787)	81, 89, 225
Scymnus (s.str.) magnomaculatus Fürsch, 1958	80, 95, 100, 136, 141, 221, 264
Scymnus (s.str.) nigrinus Kugelann, 1794	88, 102, 108, 122, 138, 169, 185, 194, 197, 218, 227, 230, 353, 380, 386
Scymnus (s.str.) rubromaculatus (Goeze, 1777)	50, 86, 88, 90, 96, 100, 104, 107, 108, 112, 138, 156, 181, 182, 184, 197, 199, 214, 218, 230, 390
Scymnus (s.str.) suffrianioides J.Sahlberg, 1913	9, 11, 18, 30, 37, 46, 47, 48, 56, 58, 64, 65, 66, 68, 72, 80, 81, 83, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96, 98, 99, 100, 101, 102, 103, 107, 116, 117, 122, 125, 126, 135, 136, 138, 139, 140, 141, 143, 146, 150, 153, 156, 157, 159, 161, 168, 172, 175, 178, 183, 184, 185, 188, 189, 191, 195, 196, 197, 198, 199, 201, 204, 211, 214, 215, 217, 220, 221, 225, 230, 268, 270, 274, 281, 292, 296, 298, 315, 316, 328, 333, 334, 339, 350, 352, 358, 359, 361, 370, 374, 375, 379, 385, 386, 387, 390, 393, 400, 402, 404, 407, 408, 409, 411, 412, 413, 414, 416, 417, 418, 419, 423, 426, 429, 430, 439, 441, 443, 446, 449, 450, 451, 453, 455, 459

Table 2. (Continued)

Species	Locality Code
Stethorus () gilvifrons (Mulsant, 1850)	208, 230, 381
Chilocorus bipustulatus (Linnaeus, 1758)	230, 247, 251, 285, 395, 463, 468
Exochomus octosignatus (Gebler, 1830)	335, 407
Exochomus quadripustulatus (Linnaeus, 1758)	35, 48, 64, 70, 75, 76, 88, 138, 220, 234, 267, 295, 299, 401, 436, 441, 446, 473, 480
Exochomus undulatus Weise, 1878	109
Parexochomus nigripennis Erichson, 1843	124, 170, 189, 207, 399, 433
Parexochomus nigromaculatus (Goeze, 1777)	20, 25, 27, 37, 44, 46, 47, 68, 84, 87, 90, 95, 98, 103, 117, 118, 121, 124, 125, 140, 141, 146, 147, 154, 159, 170, 183, 186, 189, 193, 196, 199, 200, 207, 212, 214, 221, 222, 224, 290, 301, 359, 377, 383, 386, 394, 399, 400, 403, 404, 407, 415, 433, 443, 444, 449, 452, 465, 479
Platynaspis luteorubra (Goeze, 1777)	118, 396, 397
Psyllobora () vigintiduopunctata (Linnaeus, 1758)	2, 14, 37, 96, 104, 107, 129, 132, 145, 148, 154, 156, 159, 170, 179, 198, 203, 218, 225, 244, 300, 311, 379, 393, 394, 399, 404, 411, 419, 425, 431, 476
Vibidia duodecimguttata (Poda, 1761)	63, 330
Bulaea lichatschovii (Hummel, 1827)	1, 17, 26, 27, 260, 392
Coccinula quatuordecimpustulata (Linnaeus, 1758)	5, 10, 20, 21, 23, 31, 32, 33, 34, 35, 36, 39, 42, 43, 44, 45, 48, 50, 51, 58, 60, 61, 62, 63, 64, 65, 67, 68, 70, 71, 72, 73, 74, 75, 76, 78, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96, 97, 98, 99, 100, 102, 103, 107, 108, 112, 114, 116, 117, 119, 121, 126, 128, 130, 131, 132, 133, 134, 136, 137, 138, 139, 140, 141, 144, 147, 148, 149, 150, 151, 152, 153, 156, 157, 159, 161, 163, 164, 168, 169, 171, 172, 173, 176, 179, 180, 181, 182, 184, 185, 188, 194, 195, 198, 199, 204, 205, 215, 217, 219, 220, 232, 234, 247, 261, 262, 264, 268, 269, 274, 276, 277, 278, 279, 280, 281, 282, 283, 284, 288, 289, 291, 292, 294, 295, 296, 298, 303, 322, 325, 327, 328, 329, 330, 332, 333, 337, 340, 341, 346, 347, 348, 349, 350, 351, 352, 353, 354, 356, 357, 358, 359, 360, 361, 362, 363, 371, 372, 373, 374, 375, 377, 379, 383, 384, 385, 386, 387, 390, 391, 392, 393, 395, 397, 398, 399, 400, 401, 402, 403, 404, 405, 408, 409, 411, 412, 414, 415, 417, 418, 421, 423, 425, 429, 431, 432, 434, 435, 438, 441, 442, 444, 445, 446, 448, 450, 455, 459, 460, 467, 468, 480
Tytthaspis sedecimpunctata (Linnaeus, 1758)	42, 51, 66, 107, 173, 268, 346, 347
Adalia (s.str.) bipunctata (Linnaeus, 1758)	5, 6, 8, 22, 25, 27, 31, 33, 35, 36, 37, 38, 47, 52, 53, 54, 55, 59, 60, 92, 95, 156, 208, 215, 225, 232, 246, 287, 294, 307, 318, 324, 330, 332, 340, 353, 378, 414, 439, 445, 447, 463, 468, 469, 471, 472, 473, 474, 475, 480
Adalia (s.str.) decempunctata (Linnaeus, 1758)	38, 49, 53, 215, 324, 463

Table 2. (Continued)

Species	Locality Code
Coccinella (s.str.) septempunctata Linnaeus, 1758	3, 4, 5, 7, 8, 10, 11, 12, 14, 15, 17, 18, 20, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 40, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 114, 115, 117, 118, 124, 126, 127, 128, 131, 133, 136, 138, 139, 140, 142, 144, 146, 147, 150, 151, 153, 154, 156, 157, 160, 161, 162, 163, 164, 165, 167, 170, 173, 174, 178, 179, 181, 182, 185, 187, 188, 193, 198, 199, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 213, 214, 215, 216, 217, 218, 219, 220, 222, 223, 224, 225, 226, 227, 228, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 251, 252, 253, 255, 256, 257, 258, 259, 260, 261, 262, 263, 265, 266, 269, 270, 271, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 285, 286, 287, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 336, 337, 338, 339, 341, 342, 343, 344, 345, 346, 349, 350, 351, 352, 353, 355, 359, 360, 361, 362, 363, 364, 366, 367, 368, 369, 370, 371, 373, 374, 375, 376, 378, 385, 386, 387, 388, 392, 395, 400, 402, 406, 407, 412, 414, 416, 418, 423, 431, 433, 436, 437, 444, 445, 458, 463, 464, 466, 473, 477, 478, 479
Coccinella (Spilota) undecimpunctata Linnaeus, 1758	27, 32, 36, 55, 64, 71, 74, 76, 77, 79, 80, 81, 83, 84, 86, 97, 99, 106, 109, 110, 112, 157, 182, 211, 261, 269, 270, 283, 307, 308, 309, 314, 315, 319, 334, 336, 338, 341, 343, 344, 350, 366, 367, 369, 370, 372, 373, 374, 379, 387, 392, 399, 400, 402, 403, 408, 409, 411, 422, 427, 445, 449, 452, 455, 460
Harmonia axyridis (Pallas, 1773)	13, 21, 32, 45, 46, 47, 60, 63, 64, 65, 76, 82, 83, 84, 89, 92, 123, 136, 138, 142, 143, 218, 230, 239, 307, 315, 332, 346, 350, 353, 366, 374, 392, 394, 395, 415, 417, 418, 419, 421, 422, 439, 441, 445
Harmonia quadripunctata (Pontopiddian, 1763)	9, 11, 109, 113, 261
Hippodamia (s.str.) variegata (Goeze, 1777)	1, 4, 5, 7, 12, 14, 15, 16, 19, 26, 27, 29, 36, 37, 38, 45, 48, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 64, 65, 67, 68, 70, 71, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 85, 86, 87, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 107, 108, 109, 110, 111, 112, 114, 116, 117, 120, 121, 124, 125, 129, 130, 131, 134, 137, 138, 140, 144, 145, 151, 152, 154, 155, 156, 157, 158, 161, 162, 163, 166, 167, 168, 170, 176, 178, 179, 180, 183, 186, 187, 188, 189, 190, 192, 194, 195, 196, 197, 199, 200, 203, 207, 209, 210, 217, 218, 222, 223, 226, 227, 228, 229, 235, 239, 240, 243, 244, 245, 248, 249, 250, 251, 257, 258, 260, 261, 262, 269, 272, 274, 275, 276, 277, 282, 292, 300, 301, 304, 305, 306, 307, 308, 309, 310, 311, 314, 315, 316, 319, 320, 322, 324, 326, 327, 341, 343, 350, 352, 364, 365, 366, 367, 368, 370, 378, 379, 380, 381, 382, 385, 389, 392, 394, 397, 399, 400, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 415, 417, 420, 422, 423, 424, 426, 427, 428, 443, 445, 448, 452, 453, 454, 455, 456, 457, 458, 459, 461, 462, 465, 468, 469, 470, 471, 475, 478, 480
Oenopia (s.str.) conglobata (Linnaeus, 1758)	5, 37, 38, 41, 45, 47, 53, 78, 90, 186, 217, 220, 222, 228, 254, 285, 290, 324, 360, 372, 415, 440, 447, 463, 469, 479
Propylea quatuordecimpunctata (Linnaeus, 1758)	21, 36, 49, 50, 51, 59, 60, 63, 80, 82, 94, 107, 133, 200, 277, 278, 290, 340, 353, 425
Subcoccinella vigintiquatuorpunctata (Linnaeus, 1758)	42, 91, 117, 291, 327, 353, 354, 477, 480

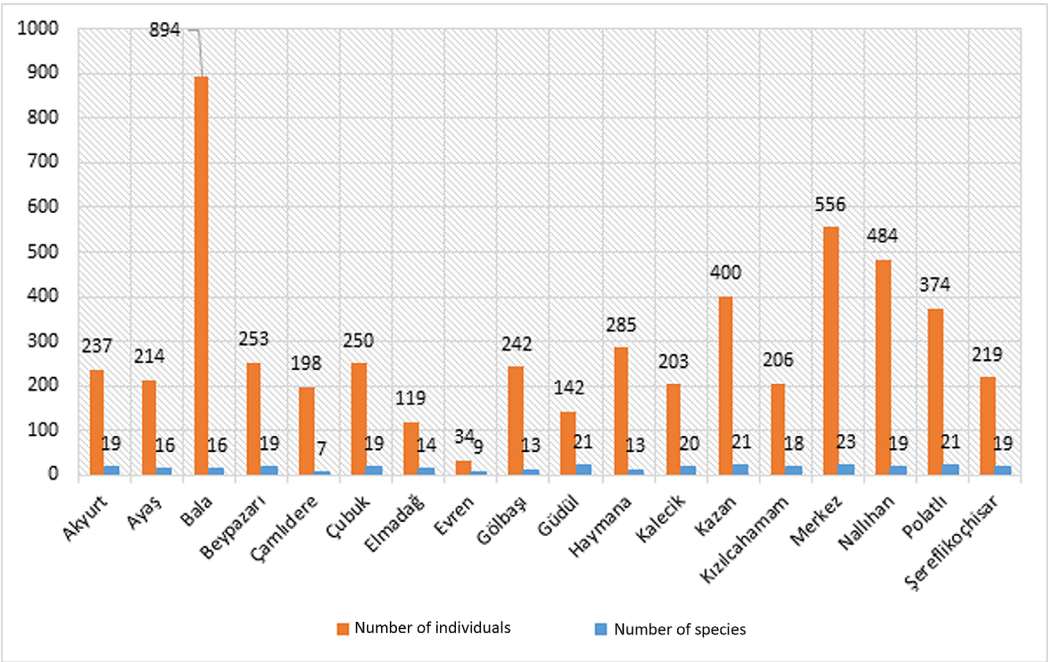

Figure 3. The number of species and collected specimens by the district.

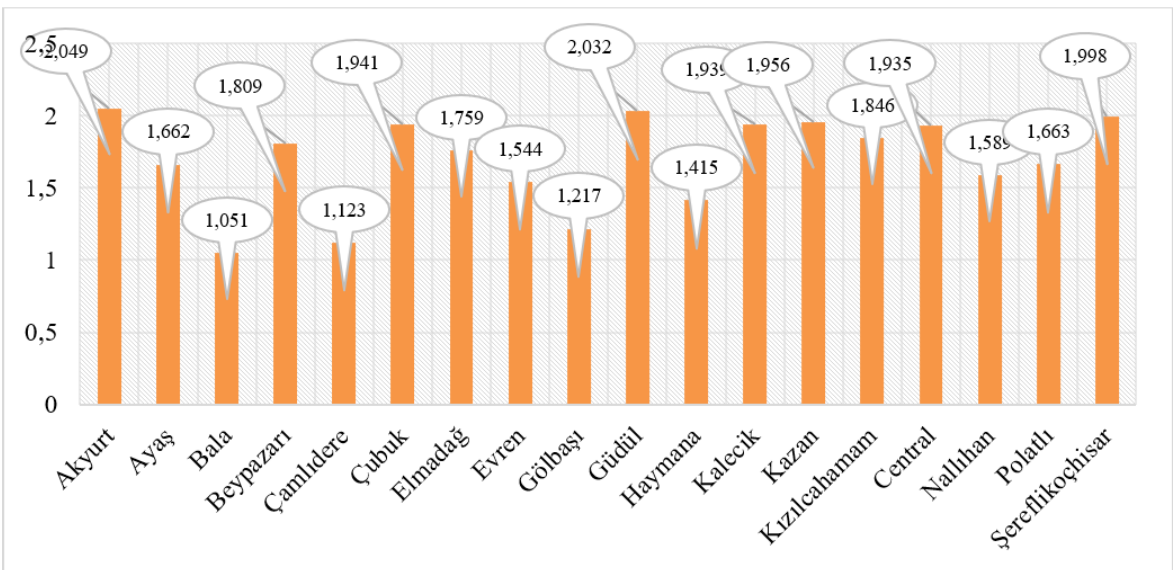

Figure 4. The determined species diversities using the Brillouin diversity index by the district.

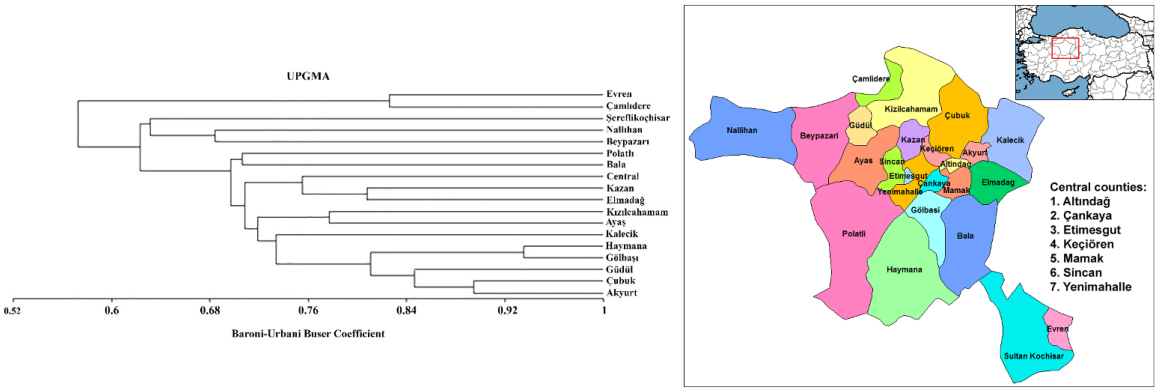

Figure 5. Dendrogram representation of the similarities of the results obtained using the Baroni-Urbani Buser similarity index in terms of Coccinellidae fauna of Ankara districts.

Figure 6. Map of subregions of the Palaearctic region (designed with ArcGIS Pro 10.8 [21]).

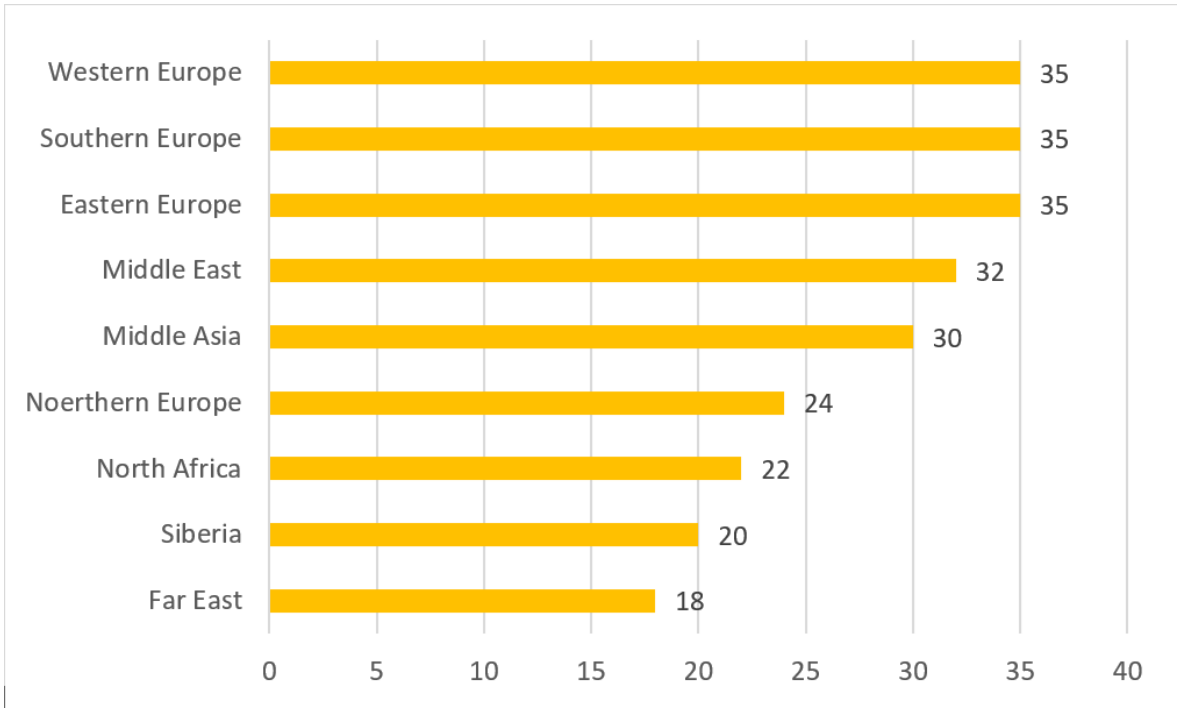

Figure 7. Distributions of detected species in the Palaearctic region and its subregions.

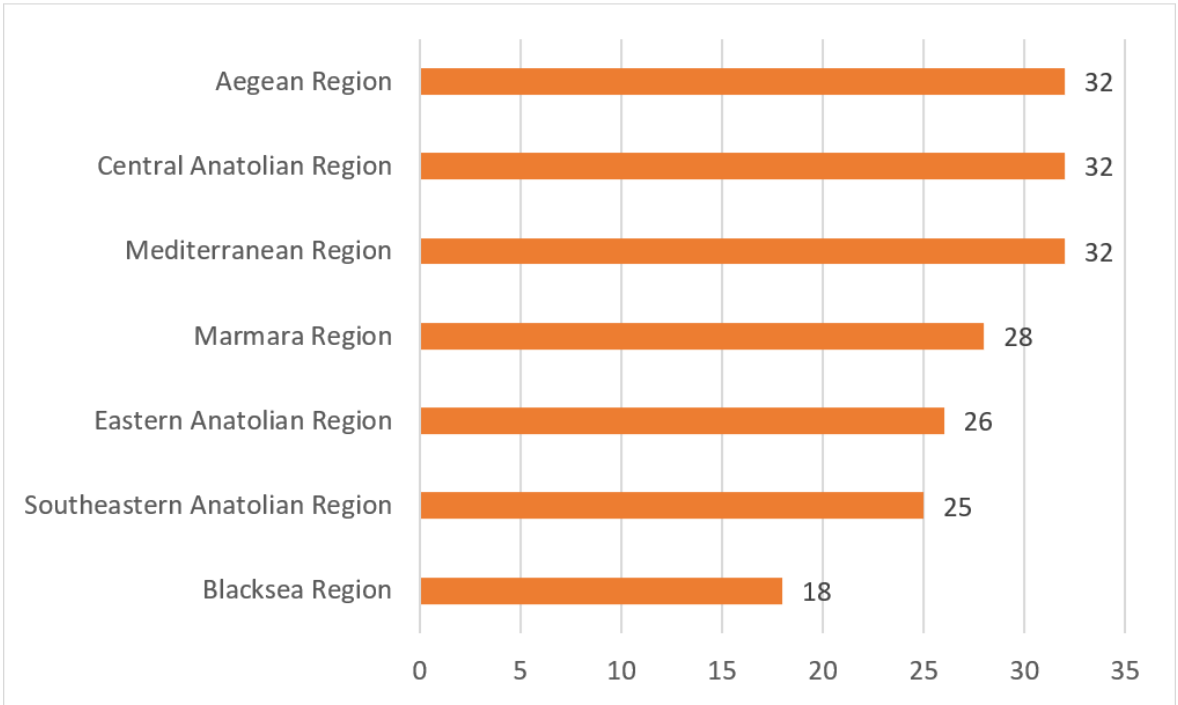

Figure 8. Distributions of detected species in geographical regions of Turkey.

Table 3. Distributions of detected species in geographical regions of Turkey and the Palaearctic region and its subregions. Geographical regions of Turkey: 1: Marmara Region, 2: Aegean Region, 3: Mediterranean Region, 4: Central Anatolian Region, 5: Blacksea Region, 6: Southeastern Anatolian Region, 7: Eastern Anatolian Region [1, 8, 11, 15, 16, 17, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44); Subregions of Palaearctic: EE: Eastern Europe, WE: Western Europe, NE: Northern Europe, SE: Southern Europe, ME: Middle East, MA: Middle Asia türleri, SB: Siberia, FE: Far East, NA: North Africa.

Species	Palaearctic Distributions	Turkey Distributions
Hyperaspis (s.str) histeroides	EE, ME, MA	6
Hyperaspis (s.str) quadrimaculata	WE, SE, EE, ME	1,2,3,4,6,7
Hyperaspis (s.str) reppensis	WE, SE, NE, EE, SB, MA, NA	1,2,4,5,7
Nephus (Bipunctatus) nigricans nigricans	WE, SE, NA	1,2,3,4,6,7
Scymnus (Mimopullus) flagellisiphonatus	WE, SE, EE, ME	1,2,4
Scymnus (Mimopullus) pharaonis	WE, SE, EE, ME, NA	3,4,6,7
Scymnus (Pullus) auritus	WE SE NE EE SB ME MA FE	2,3,7
Scymnus (Pullus) subvillosus	WE, SE, EE, ME, MA, NA	1,2,3,4,6,7
Scymnus (s.str) apetzi	WE, SE, EE, SB, ME, MA	1,2,3,4,6,7
Scymnus (s.str) bivulnerus	WE, SE, ME, NA	3,4,6,7
Scymnus (s.str) frontalis	WE, SE, NE, EE, SB, ME, MA, FE	1,2,4,5,6,7
Scymnus (s.str) magnomaculatus	WE, SE, EE, ME	1,2,3,4,5,6
Scymnus (s.str) nigrinus	WE, SE, NE, EE, SB, MA, FE	3
Scymnus (s.str) rubromaculatus	WE, SE, NE, EE, SB, MA, FE, NA	1,2,3,4,5,6,7
Scymnus (s.str) suffrianioides	WE, SE, NE, EE, ME	1,2,3,4,6,7
Stethorus (s.str) gilvifrons	WE, SE, EE, ME, MA, NA	1,2,4,7
Chilocorus bipustulatus	WE, SE, NE, EE, ME, MA, FE, NA	1,2,3,4,5,6,7
Exochomus octosignatus	WE, SE, EE, ME, MA	3,6
Exochomus quadripustulatus	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5,6,7
Exochomus undulatus	EE, ME, MA, NA	2,3,4

Table 3. (Continued)

Parexochomus nigripennis	SE, ME, MA, NA	2,3,4
Parexochomus nigromaculatus	WE, SE, NE, EE, SB, ME, MA, FE	1,2,3,4,6,7
Platynaspis luteorubra	WE, SE, NE, EE, SB, ME, MA, NA	1,2,3,4,5,6,7
Psyllobora (Thea) vigintiduopunctata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5,6,7
Vibidia duodecimguttata	WE, SE, NE, EE, SB, ME, MA, FE	2,3,4,5
Bulaea lichatschovii	WE, SE, EE, ME, MA	2,3
Coccinula quatuordecimpustulata	WE, SE, NE, EE, SB, ME, MA	1,2,3,4,6,7
Tytthaspis sedecimpunctata	WE, SE, NE, EE, MA, NA	1,3,4,6
Adalia (s.str) bipunctata	WE, SE, NE, EE, ME, MA, FE, NA	1,2,3,4,5,6,7
Adalia (s.str) decempunctata	WE, SE, NE, EE, SB, ME, NA	1,2,3,4,5,6,7
Coccinella (s.str) septempunctata	WE, SE, NE, EE, ME, MA, FE, NA	1,2,3,4,5,6,7
Coccinella (Spilota) undecimpunctata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,4,7
Harmonia axyridis	WE, NE, EE, SB, MA, FE	1,2,3,5
Harmonia quadripunctata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5
Hippodamia (s.str) variegata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5,6,7
Oenopia (s.str) conglobata conglobata	WE, SE, NE, EE, SB, ME, MA, FE	1,2,3,4,5,6,7
Propylea quatuordecimpunctata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5,6,7
Subcoccinella vigintiquatuorpunctata	WE, SE, NE, EE, SB, ME, MA, FE, NA	1,2,3,4,5,6

Most species were collected from the Central district with 23 species (556 individuals). This district is followed by Güdül, Kazan and Polatlı with 21 species, Kalecik with 20 species, Beypazarı, Çubuk, Nallıhan and Şereflikoçhisar with 19 species (Figure 3). In the analysis made according to the Brillouin diversity index in the study area, it was seen that the highest species diversity in terms of the Coccinellidae family was found in Akyurt and Güdül districts (Figure 4). It has been observed that the remaining districts (except Bala, Çamlıdere, Gölbaşı, and Haymana) are relatively different in terms of species diversity. The reason why species diversity is low in Bala, Çamlıdere, Gölbaşı, and Haymana districts is that the vegetation is less diverse within the boundaries of this district and the climate is uniform (e.g. Çamlıdere district is mostly forest vegetation and rainy, Black Sea climate, Bala, Gölbaşı and Haymana districts are also steppe vegetation and arid, terrestrial climate). Although the number of species is lower, it is thought that the reason why Akyurt and Güdül districts appear to have higher species diversity as a result of the analysis is a more homogeneous distribution than the districts of Merkez, Polatlı, and Kazan in the number of species and individuals.

The similarities of the faunas of Ankara districts were compared (Figure 5) and some of the vegetation and climatic features are similar and the faunas of the districts that are geographically close (e.g. Haymana-Gölbaşı, Çubuk-Akyurt, Kazan-Elmadağ-Merkez, Kızılcahamam-Ayaş) demonstrated and supported. Apart from this, some different vegetation types and climatic features and the districts whose fauna are expected to be slightly different from each other have been seen to be similar, and the reason for this is that various factors such as sampling date, habitat type, and air temperature may be effective in field studies. Also, agricultural activities could affect Coccinellid faunas of counties. Because many species feed on important agricultural pests.

The species identified within the scope of this study were evaluated according to the subregions of the Palaearctic Region (Figure 6) and 35 of the 38 identified species were different species compositions; It has been seen in common with Eastern Europe, Southern, Europe, and Western Europe. This is followed by the Middle East with 32 species, Central Asia with 30 species, Northern Europe with 24 species, North Africa with 22 species, Siberia with 20, species and the Far East with 18 species (Figure 7, Table 3). Considering the distribution of the detected species in the subregions of the Palaearctic Region, it was observed that *Exochomus quadripustulatus*, *Psyllobora (Thea) vigintiduopunctata*, *Coccinella (Spilota) undecimpunctata*, *Harmonia quadri-*

punctata, *Hippodamia (Hippodamia) vigintiduopunctata* in the subregion of the Palaearctic. Within the scope of this study, 92.11% of the species identified in Ankara province are shared with Eastern Europe, Southern Europe, and Western Europe separately, and 84.21% are shared with the Middle East. This shows that Turkey and Ankara have very rich fauna in terms of the Coccinellidae family.

Due to the current literature is examined, with this study, *Scymnus (s.str) apetzi*, *S. (s.str) magnomaculatus*, *S. (s.str) suffrianioides suffrianioides*, *Exochomus octosignatus*, *Coccinella (Spilota) undecimpunctata*, *Harmonia axyridis* were detected for the first time from Ankara province. *Hyperaspis (s.str) hysteroides*, *Hyperaspis (s.str) reppensis*, *Scymnus (Mimopullus) flagellisiphonatus*, *S. (s.str.) frontalis*, *Stethorus (s.str.) gilvifrons* were detected for the first time from the Central Anatolia Region.

When the distribution of the detected species in Turkey is examined, 32 species are found in the Aegean, Central Anatolia, and Mediterranean Regions, 28 species in the Marmara Region, 26 species in the Eastern Anatolia Region, 25 species in the Southeastern Anatolia Region and 18 species in the Black Sea Region (Figure 8, Table 3). Although the province of Ankara is geographically located in the Central Anatolia Region and partially in the Black Sea Region, it is an interesting result that it has an equal number of common species with the Central Anatolia, Mediterranean and Aegean Regions. Among the possible reasons for this, the fact that the species of the Coccinellidae family are relatively widespread when compared to other insect families may be one of the first reasons that come to mind. Another possible reason is thought to be the gap in the literature due to the inadequacy of comprehensive studies on this family throughout Turkey. When the distribution areas of the species are examined according to the Geographical Regions, 11 (28.9%) of the identified species are distributed in all regions. Although *Hyperaspis (Hyperaspis) hysteroides* and *Scymnus (Scymnus) nigrinus* species have been recorded from one geographical region in the current literature, the number of geographical areas in which they are distributed in the literature increases to two with this study. As a result, the Coccinellidae fauna of Ankara province mostly shows parallelism with the fauna of the Central Anatolia region in which it is located.

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