

Faunistic Study on the Family Meloidae (Coleoptera) of Ankara Province (Turkey)

Ankara İli (Türkiye) Meloidae (Coleoptera) Familyası Üzerine Faunistik Çalışma

Muhammed Arif Demir ¹ and Mahmut Kabalak ^{1,2*}

¹Department of Biology, Hacettepe University, Beytepe, Ankara, Turkey.

²Hacettepe University Biodiversity Research and Application Center, Ankara, Turkey.

ABSTRACT

The main aim of this study is to determining Meloidae fauna of Ankara. 3301 specimens were collected. 43 species belonging to 2 subfamilies and 15 genera were identified. The genus *Mylabris* Fabricius, 1775 is the most species-rich genus with 10 species. *Cerocomia* (s.str.) *bernhaueri* Pardo Alcaide, 1977, *Alosimus luteus* (Waltl, 1838), *Teratolytta monticola* Bologna, 2006, *Hycleus polymorphus* (Pallas, 1771), *H. sexmaculatus* (A.G. Olivier, 1811), *Mylabris* (*Micrabris*) *unicolor* Faldermann, 1837, *Meloe* (*Eurymeloe*) *mediterraneus* (G. Muller, 1925) and *Stenoria* (s.str.) *apicalis* (Latreille, 1804) species were recorded from Central Anatolian Region of Turkey for the first time. Detailed locality records of *M. (Micrabris) unicolor* and *S. (s.str.) apicalis* in Turkey were given with this study for the first time. The most western distributions of *Alosimus luteus* and *Teratolytta monticola* were given with this study.

Key Words

Meloidae, Ankara, Turkey, Faunistic evaluations.

Öz

Bu çalışmanın temel amacı Ankara'nın Meloidae faunasını belirlemektir. 3301 örnek toplanmıştır. 2 altfamilya ve 15 cinse ait toplam 43 tür tespit edilmiştir. *Mylabris* Fabricius cinsi, 1775, 10 türle tür sayısı açısından en zengin cinstir. *Cerocomia* (s.str.) *bernhaueri* Pardo Alcaide, 1977, *Alosimus luteus* (Waltl, 1838), *Teratolytta monticola* Bologna, 2006, *Hycleus polymorphus* (Pallas, 1771), *H. sexmaculatus* (AG Olivier, 1811), *Mylabris* (*Micrabris*) *unicolor* Faldermann, 1837, *Meloe* (*Eurymeloe*) *mediterraneus* (G. Muller, 1925) ve *Stenoria* (s.str.) *apicalis* (Latreille, 1804) türleri ilk defa bu çalışma ile Türkiye'nin İç Anadolu Bölgesi'nden kayıt edilmiştir. *M. (Micrabris) unicolor* ve *S. (s.str.) apicalis*'in bu çalışma ile Türkiye için ilk defa detaylı lokalite kaydı verilmiştir. *Alosimus luteus* ve *Teratolytta monticola* türlerinin en batı kaydı bu çalışma ile verilmiştir.

Anahtar Kelimeler

Meloidae, Ankara, Türkiye, Faunistik değerlendirmeler.

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Correspondence to: M. Kabalak, Department of Biology, Hacettepe University, Ankara, Turkey.

E-Mail: mahmut@hacettepe.edu.tr

INTRODUCTION

The family Meloidae (Coleoptera) has about 3000 species belonging to 120 genera in the Palearctic Region [1]. This family, also known as blister beetles, is cosmopolitan (except New Zealand, Antarctica and most Polynesian islands) [2]. Species distribute in the temperate steppe, arid regions, semi-tropics, tropical savannas, or other open habitats [3, 4].

In Turkey, many researchers have conducted researches on this family. Bologna [5] reported that the greatest contributions to the knowledge of the Turkish Meloidae fauna were made by some German and Austrian researchers such as Ganglbauer, Haag-Rutenberg, von Heyden, Kraatz, Procházka and Reitter. Researchers such as Escherich, Marseul, Abeille de Perrin and Friwaldsky have also made significant contributions. In addition, revision of genera covering most Mediterranean species by researchers such as Maran, Kaszab, Muehle and Alcázar helped to know the Turkish Meloidae fauna. In addition, Bologna [5], gave 56 species belonging to 12 genera from Turkey. Öncüler [6] listed 91 species, including new records for Turkey. Nizamioğlu (1964), Özer and Duran (1968), Özbek (1979), Giray (1985), and Yıldırım and Özbek (1992) mentioned some species of Meloidae as agricultural pests in Turkey [7]. Lodos [8] gave general information (including life cycle and some agricultural pest species) about this family. Özbek and Szaloki [7] examined more than 4000 specimens, which were collected 1970-1996, and 147 species belonging to 2 subfamilies and 17 genera in Turkey. There are three MSc. thesis' on the family Meloidae in Turkey [9-11]. According to recent literature, the Meloidae fauna of Turkey is represented by 2 subfamilies, 23 genera and 177 species (including 27 endemic species) [12-18].

The main purpose of this study is to determine the faunistic composition of the family Meloidae in Ankara province. Escherich [19] stated that Ankara Meloidae fauna is enormously rich and there are more than 40 species. In accordance with this report, we totally detected 43 species belonging to 2 subfamilies and 15 genera from Ankara province.

Study area

Ankara Province has an area of 26,897 km² and 25 districts (Altındağ, Çankaya, Mamak, Keçiören, Sincan, Yenimahalle, Akyurt, Beypazarı, Çamlıdere, Çubuk, Elmadağ, Etimesgut, Evren, Kahramankazan, Gölbaşı, Balâ, Ayaş,

Güdül, Haymana, Kalecik, Kızılcahamam, Nallıhan, Polatlı, Pursaklar and Şereflikoçhisar). 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. It is also located at the intersection of four geographical sections of Turkey (Konya Section, Upper Sakarya Section, Middle Kızılırmak Section, Western Black Sea Section) [20] (Figure 1). Terrestrial climate conditions are dominated in study area. Climatic differences are observed throughout the province; Its south part has the distinct steppe climate, which is the clear features of the Central Anatolia climate, and the temperate and rainy effect of the Black Sea climate are observed in the North. Due to these characteristics, Ankara could be accepted as an intersection area having the characteristics of terrestrial climate [21].

MATERIALS and METHODS

Material and methods of this study consist of three main phases. These are field studies for specimen collecting, laboratory studies for species determining of collected specimens and analyses of all collected data.

Field studies

In this study, 3301 adult specimens were collected from 548 locations in 69 days (33 days between May and October 2018 and 36 days between April and October 2019) in Ankara (Figure 1). Specimens were collected from various habitats and Meloidae specimens were found from some habitats such as river-stream edges, open forest areas, road and field edges, meadows. Specimens were collected using insect net and aspirator. Details of the locations with examples are shown in Table 1.

Laboratory studies

3301 adult specimens collected by field studies were examined for this study, and were identified at subfamily and genus, and then male and female specimens were separated, and species were identified. Identification of species was made with taxonomic keys and species descriptions in the related literature [3, 5, 9-11, 15-17, 24-42]. The male genital organs were dissected and compared with the drawings in the current literature for confirmation of species diagnosis.

Data analysis

In faunistic evaluations, species diversities of the districts and Turkey's geographical sections, which are lo-

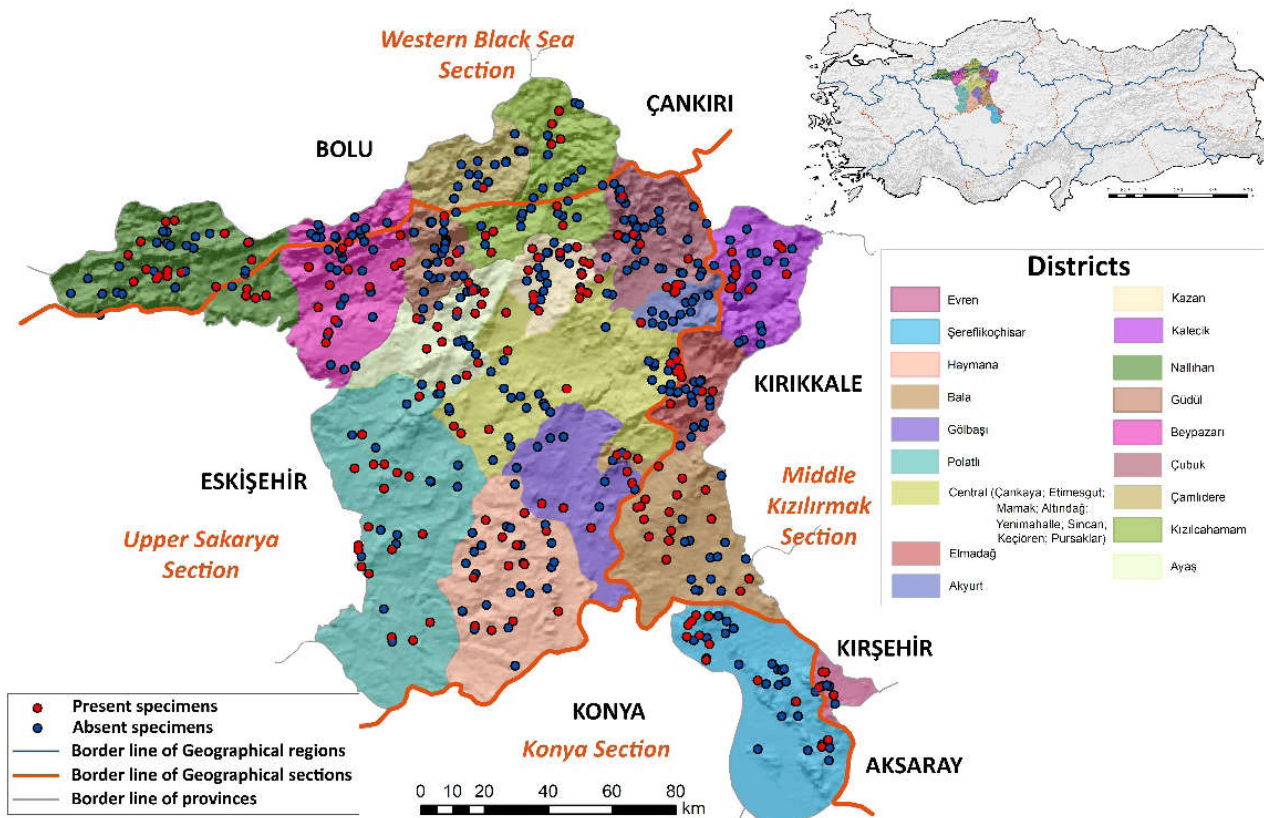


Figure 1. Map of Ankara province (districts are shown in different colors) and collecting localities with presence/absence of specimens (Districts, province, geographical regions and sections data was taken from the Turkey General Directorate of Mapping [22] and designed with ArcGIS Pro [23]).

cated within the boundaries of Ankara province, were evaluated using the Brillouin diversity index [43]. Brillouin diversity index, which is recommended and used in diversity calculations, in cases where ecological randomness is not fully achieved and in studies on collection materials, is considered to be more suitable for this study than other diversity indices. This analysis was made using the software of Past 3.25 [44]. The districts where the urbanization is intense and around the center (Altındağ, Çankaya, Etimesgut, Keçiören, Mamak, Pursaklar, Sincan, Yenimahalle) are evaluated as the Central district. Faunal similarities between Meloidae fauna were determined in this study and faunistic data in the existing literature of the Central Anatolian Region were compared with Baroni-Urbani Büser index [45]. The reason for choosing that it is considered as a better comparison indicator than Sørensen and Jaccard indexes with its evaluation both of the species found in both fauna and the species not found in both fauna. This analysis was done using MVSP 3.21 (MultiVariate Statistical Package 3.21) software [46].

With this study, *Teratolytta gentilis* (Frivaldszky, 1877), which was determined from Ankara and its detailed locality information was unknown until this study, was not

included in the evaluations requiring locality information (collecting coordinate and district).

RESULTS

In this study, 3301 specimens were collected. 43 species belonging to fifteen genera and two subfamilies were detected during field studies. Code of collecting localities and the number of specimens of species are shown in Table 2. It is noteworthy that the genus *Mylabris* has the largest amount of species (10 species) following by *Cerocomia* (6 species), *Alosimus* and *Hycleus* (4 species), *Meloe*, *Euzonitis* and *Zonitis* (3 species), *Teratolytta*, *Stenodera* (2 species) and *Lydus*, *Oenas*, *Lytta*, *Actenodia*, *Nemognatha*, *Stenoria* (one species each) (Figure 2).

The largest amount of species among the detected species were collected from Bala district (20 species, 631 specimens). This district is followed by Polatlı (18 species, 343 specimens), Haymana (16 species, 389 specimens), Central (15 species), Şereflikoçhisar (13 species), Ayaş, Kazan and Nallıhan (12 species). According to the Brillouin diversity index, species diversity was found the highest in the Central district and later in the Ayaş dis-

Table 1. Details of collecting localities.

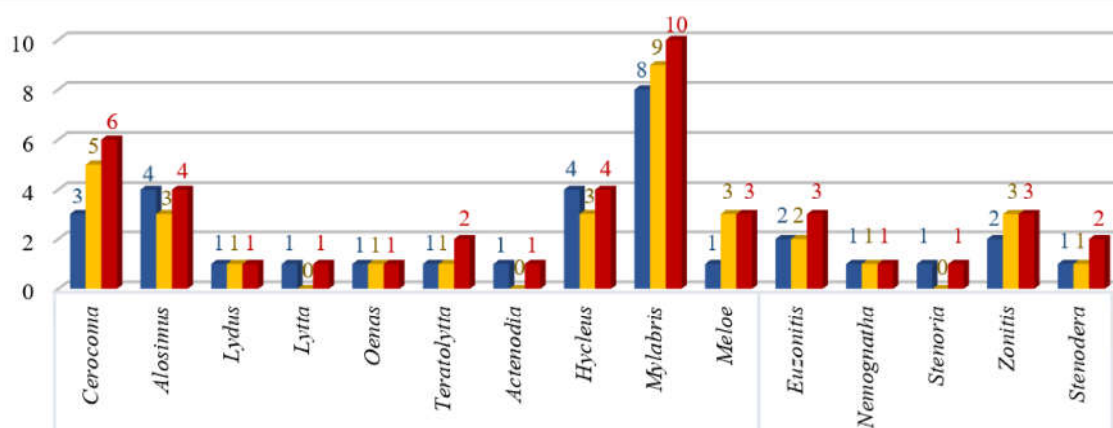
Loc. Code	Date	Coordinates		Altitude (m)	Loc. Code	Date	Coordinates		Altitude (m)
		Latitude (N)	Longitude (E)				Latitude (N)	Longitude (E)	
1	07.04.2018	39°52'08.00"	32°44'03.00"	970.0	34	26.06.2018	39°41'17.53"	32°55'11.78"	1256.7
2	13.05.2018	39°44'17.54"	32°20'50.42"	754.7	35	26.06.2018	39°41'18.71"	32°57'16.32"	1174.6
3	13.05.2018	39°45'28.18"	32°19'13.55"	787.4	36	26.06.2018	39°36'38.57"	32°58'38.98"	1018.6
4	13.05.2018	39°50'20.89"	32°11'29.50"	861.5	37	26.06.2018	39°33'51.62"	33°01'39.58"	1019
5	13.05.2018	39°38'32.35"	32°01'51.22"	727.5	38	26.06.2018	39°30'46.11"	33°16'12.30"	963.7
6	16.05.2018	40°04'41.94"	32°23'13.38"	1097.5	39	26.06.2018	39°20'42.81"	33°24'40.69"	1034.1
7	18.05.2018	39°10'56.70"	33°14'04.86"	981.2	40	26.06.2018	39°39'31.59"	33°04'23.44"	968.6
8	18.05.2018	39°05'06.54"	33°40'58.56"	931.9	41	27.06.2018	39°43'06.06"	33°09'07.57"	915.4
9	19.05.2018	40°11'27.72"	31°54'51.36"	757.7	42	27.06.2018	40°04'59.28"	32°30'03.86"	911.2
10	19.05.2018	40°16'06.90"	31°54'48.06"	1048.6	43	27.06.2018	40°08'06.72"	32°35'53.30"	856
11	19.05.2018	40°03'33.22"	32°10'23.67"	606.1	44	27.06.2018	40°12'16.24"	32°34'41.56"	1087.6
12	23.05.2018	39°58'31.80"	32°30'35.28"	800.6	45	27.06.2018	40°14'28.67"	32°36'47.18"	1074.4
13	23.05.2018	39°56'19.98"	32°24'09.60"	993.7	46	27.06.2018	40°15'55.28"	32°35'28.78"	1269.6
14	23.05.2018	39°54'11.22"	32°21'44.04"	865.3	47	28.06.2018	39°57'02.54"	33°06'28.03"	1128.4
15	23.05.2018	40°04'54.18"	32°19'17.52"	941.2	48	28.06.2018	39°55'36.83"	33°07'54.31"	1201.3
16	30.05.2018	40°03'50.46"	32°59'50.52"	971	49	28.06.2018	39°52'22.24"	33°13'36.31"	1149.1
17	30.05.2018	40°09'58.68"	33°19'14.28"	1088	50	28.06.2018	39°49'54.72"	33°15'24.13"	876.1
18	30.05.2018	40°16'04.32"	33°19'37.62"	995.9	51	29.06.2018	39°37'47.94"	31°57'43.19"	688.6
19	2.06.2018	39°52'21.60"	32°43'46.93"	1012	52	29.06.2018	39°23'58.69"	31°59'07.41"	711.2
20	11.06.2018	40°11'06.56"	32°50'19.27"	1168.5	53	29.06.2018	39°21'08.21"	31°59'56.36"	723.5
21	12.06.2018	39°32'44.14"	32°38'59.89"	1146.6	54	29.06.2018	39°08'56.37"	32°11'42.69"	852.3
22	12.06.2018	39°28'06.77"	32°40'07.52"	1223.5	55	29.06.2018	39°12'04.41"	32°15'17.23"	803.4
23	12.06.2018	39°14'31.70"	32°43'08.45"	1144.8	56	29.06.2018	39°27'00.18"	32°13'03.04"	998
24	12.06.2018	39°12'38.92"	32°33'21.57"	1279.8	57	10.07.2018	39°32'06.69"	32°43'46.40"	1062
25	12.06.2018	39°28'48.96"	32°49'55.19"	1294.8	58	19.07.2018	39°03'29.38"	33°26'58.76"	1077.4
26	13.06.2018	40°20'01.32"	32°42'06.48"	971	59	19.07.2018	39°02'45.90"	33°31'30.30"	1068.4
27	25.06.2018	40°06'37.80"	31°36'54.84"	475.5	60	19.07.2018	38°59'58.20"	33°35'24.90"	1046.1
28	25.06.2018	40°12'33.29"	31°33'29.18"	975.5	61	19.07.2018	39°02'23.30"	33°40'18.00"	1355.8
29	25.06.2018	40°15'26.86"	31°32'30.80"	1361.3	62	19.07.2018	39°01'08.00"	33°43'30.30"	1040.8
30	25.06.2018	40°16'51.22"	31°27'17.66"	922	63	19.07.2018	38°53'34.10"	33°42'28.60"	1104.1
31	25.06.2018	40°09'58.11"	31°17'59.70"	729.6	64	19.07.2018	39°12'40.40"	33°11'31.70"	1083.4
32	25.06.2018	40°09'14.63"	31°14'58.08"	1069.5	65	20.07.2018	40°08'44.10"	31°50'54.50"	649.6
33	25.06.2018	40°08'02.94"	31°07'35.28"	686.2	66	20.07.2018	40°11'39.20"	31°46'10.50"	866.7

Table 1. Details of collecting localities. (Continued)

Loc. Code	Date	Coordinates		Altitude (m)	Loc. Code	Date	Coordinates		Altitude (m)
		Latitude (N)	Longitude (E)				Latitude (N)	Longitude (E)	
67	20.07.2018	40°04'53.10"	31°48'31.10"	498.1	100	05.08.2018	40°11'44.50"	32°46'33.70"	1077
68	20.07.2018	40°02'50.90"	31°52'20.10"	641.5	101	05.08.2018	40°08'39.60"	32°47'53.70"	1252.3
69	20.07.2018	40°00'42.20"	31°51'00.90"	922.8	102	28.08.2018	39°45'04.97"	32°26'58.01"	816.9
70	20.07.2018	39°58'56.70"	31°50'29.40"	1023.5	103	20.04.2019	39°03'29.22"	33°26'54.96"	1065.7
71	21.07.2018	39°59'43.10"	32°16'06.10"	794.8	104	22.04.2019	39°52'13.80"	32°16'06.72"	758.6
72	21.07.2018	39°58'27.50"	32°12'44.00"	828.5	105	22.04.2019	40°02'16.38"	32°14'59.34"	706.6
73	21.07.2018	40°03'24.70"	32°11'10.80"	612.9	106	07.05.2019	40°06'06.87"	31°34'38.93"	561.3
74	21.07.2018	40°21'02.90"	32°15'46.70"	1346	107	07.05.2019	40°06'25.45"	31°32'31.19"	589
75	21.07.2018	40°13'19.60"	32°17'09.40"	824.7	108	07.05.2019	40°07'35.89"	31°32'41.15"	617.8
76	21.07.2018	40°14'54.20"	32°18'49.50"	949.6	109	23.05.2019	39°40'43.98"	32°59'48.54"	1050.1
77	22.07.2018	40°09'06.00"	33°07'03.50"	1217	110	23.05.2019	39°38'29.94"	32°57'30.90"	1111.1
78	22.07.2018	40°10'23.30"	33°08'03.60"	1332.8	111	23.05.2019	39°36'29.40"	32°58'43.56"	1014
79	22.07.2018	40°09'45.00"	33°23'38.10"	983.9	112	23.05.2019	39°32'29.34"	32°59'52.56"	1197.8
80	22.07.2018	40°15'56.30"	33°23'53.20"	939.3	113	23.05.2019	39°32'38.16"	33°00'39.90"	1165.5
81	22.07.2018	40°12'30.40"	33°31'50.00"	673.6	114	23.05.2019	39°37'33.78"	33°09'38.58"	1089.8
82	23.07.2018	40°14'48.10"	33°09'59.70"	1005.3	115	24.05.2019	40°26'04.10"	32°24'09.40"	1048.2
83	23.07.2018	40°25'13.80"	32°55'07.80"	1535.9	116	25.05.2019	40°17'09.20"	32°59'16.20"	1213
84	24.07.2018	40°15'07.00"	32°26'23.50"	1268	117	26.05.2019	39°52'24.00"	33°15'56.20"	944
85	24.07.2018	40°17'56.90"	32°25'01.30"	773.5	118	18.06.2019	40°15'03.30"	31°53'23.90"	1212.8
86	25.07.2018	39°31'03.80"	32°35'13.10"	1226.9	119	19.06.2019	39°36'41.20"	32°09'44.00"	930.2
87	25.07.2018	39°29'39.70"	32°26'46.20"	969.2	120	19.06.2019	39°37'17.90"	32°07'06.20"	957.4
88	25.07.2018	39°11'40.30"	32°25'06.80"	1038.8	121	19.06.2019	39°38'38.50"	32°04'14.70"	784.4
89	25.07.2018	39°22'01.50"	32°32'03.50"	1245	122	19.06.2019	39°43'33.60"	31°59'08.70"	677.7
90	26.07.2018	39°31'48.80"	33°06'55.20"	1284.2	123	19.06.2019	39°34'31.10"	32°04'19.80"	800.6
91	26.07.2018	39°30'27.00"	33°01'25.40"	1281.2	124	20.06.2019	40°07'18.50"	32°36'06.60"	848.8
92	26.07.2018	39°27'32.60"	33°02'36.50"	1125.8	125	21.06.2019	40°10'15.00"	33°19'48.90"	1087
93	26.07.2018	39°26'55.40"	33°07'06.30"	962.6	126	21.06.2019	40°12'13.50"	33°20'34.80"	1039.9
94	26.07.2018	39°35'40.90"	33°14'48.90"	1129.7	127	21.06.2019	40°13'24.20"	33°20'34.80"	1032.8
95	26.07.2018	39°34'42.80"	33°08'30.70"	1164.2	128	21.06.2019	40°12'29.70"	33°31'51.10"	674
96	04.08.2018	40°14'55.40"	31°08'47.90"	1386.1	129	27.06.2019	40°06'16.00"	32°24'34.00"	1033
97	04.08.2018	40°12'34.70"	31°06'04.90"	835.9	130	27.06.2019	40°08'20.40"	32°25'07.00"	1035.4
98	04.08.2018	40°10'14.60"	31°10'16.60"	742.6	131	27.06.2019	40°08'35.00"	32°22'43.50"	884.5
99	04.08.2018	40°07'44.40"	31°25'49.50"	537.3	132	27.06.2019	40°09'50.10"	32°21'35.20"	1023.3

Table 1. Details of collecting localities. (Continued)

Loc. Code	Date	Coordinates		Altitude (m)	Loc. Code	Date	Coordinates		Altitude (m)
		Latitude (N)	Longitude (E)				Latitude (N)	Longitude (E)	
133	28.06.2019	39°10'40.50"	33°11'19.90"	1077.5	162	26.07.2019	40°18'33.80"	32°54'21.00"	1269
134	28.06.2019	39°13'21.70"	33°12'18.40"	1198.2	163	26.07.2019	40°18'47.20"	32°57'43.50"	1216.7
135	28.06.2019	39°14'21.90"	33°13'14.10"	1270.3	164	27.07.2019	39°27'55.50"	32°01'12.10"	733.5
136	28.06.2019	39°14'14.00"	33°15'57.70"	1307.9	165	27.07.2019	39°24'45.10"	31°59'07.50"	706.5
137	28.06.2019	39°09'29.60"	33°16'16.20"	928.9	166	27.07.2019	39°20'00.00"	32°01'35.80"	730
138	28.06.2019	39°05'03.10"	33°41'37.50"	895.3	167	27.07.2019	39°09'19.70"	32°07'01.10"	908.3
139	29.06.2019	39°25'33.80"	32°33'45.70"	1278.3	168	27.07.2019	39°24'13.50"	32°06'30.00"	926
140	29.06.2019	39°22'20.20"	32°35'29.70"	1118.8	169	28.07.2019	40°09'55.30"	33°05'22.50"	1082.2
141	29.06.2019	39°11'00.60"	32°28'42.80"	1158.8	170	28.07.2019	40°10'20.90"	33°07'25.20"	1287.1
142	30.06.2019	40°18'41.80"	31°16'03.30"	782.8	171	28.07.2019	40°09'17.70"	33°07'23.20"	1251.1
143	30.06.2019	40°18'27.20"	31°14'10.40"	813.4	172	28.07.2019	40°16'50.70"	33°30'42.50"	819.3
144	30.06.2019	40°10'09.70"	31°14'57.40"	948.9	173	28.07.2019	40°17'30.30"	33°29'47.30"	832.2
145	30.06.2019	40°09'14.10"	31°13'03.40"	945.9	174	29.07.2019	40°08'38.60"	31°59'42.60"	579.4
146	30.06.2019	40°08'45.70"	31°12'37.00"	959.2	175	29.07.2019	40°12'18.40"	32°05'11.60"	695.2
147	23.07.2019	40°23'14.90"	32°40'43.20"	1045.6	176	29.07.2019	40°12'59.20"	32°06'28.50"	759.8
148	23.07.2019	40°33'43.70"	32°39'04.60"	1096.2	177	29.07.2019	40°17'35.80"	32°06'09.90"	868.1
149	23.07.2019	40°34'37.50"	32°41'07.80"	1233	178	30.07.2019	40°05'27.20"	32°37'12.70"	838.9
150	23.07.2019	40°39'24.90"	32°40'34.40"	1441.4	179	30.07.2019	40°15'22.50"	32°41'35.20"	921.3
151	23.07.2019	40°37'11.70"	32°39'05.90"	1165.5	180	30.07.2019	40°16'24.60"	32°45'17.50"	1118.5
152	24.07.2019	39°57'43.50"	33°07'54.30"	1115.1	181	30.07.2019	40°13'59.40"	32°46'50.60"	926.8
153	24.07.2019	39°56'13.70"	33°08'26.60"	1211.1	182	30.07.2019	40°09'06.30"	32°46'24.90"	1273.6
154	24.07.2019	39°55'31.40"	33°08'40.60"	1241.2	183	30.07.2019	40°07'43.80"	32°46'08.40"	1111.9
155	24.07.2019	39°54'44.80"	33°09'04.50"	1425.6	184	27.08.2019	39°06'45.40"	33°15'36.40"	985.2
156	24.07.2019	39°50'08.60"	33°06'42.10"	1619.4	185	27.08.2019	38°52'22.90"	33°41'04.80"	1097.2
157	25.07.2019	39°28'38.20"	33°07'27.90"	1078.1	186	27.08.2019	38°53'35.50"	33°42'27.50"	1102.2
158	25.07.2019	39°27'00.30"	33°06'55.10"	964.3	187	29.08.2019	39°26'50.90"	32°30'30.30"	1163.7
159	25.07.2019	39°23'41.50"	33°06'31.40"	965.3	188	29.08.2019	39°19'50.60"	32°24'28.80"	1143.5
160	25.07.2019	39°18'35.40"	33°22'50.60"	836.6	189	31.08.2019	40°18'40.30"	32°26'41.80"	783.7
161	26.07.2019	40°13'39.00"	32°48'10.90"	951.9					

**Figure 2.** The number of species belonging to subfamilies and genera detected in 2018, 2019 and total.

tract. Although the number of species is less, as a result of the analysis, it seems that the district of Central and Ayaş exhibited higher species diversity (Table 3).

Ankara Meloidae fauna represents the Upper Sakarya Section, which covers the most areas and the largest amount of species (37 species). The least faunal components of Ankara are detected as parts of the Western Black Sea section and Konya section with 12 species each (Table 3, Figure 3).

Compared to the existing literature, the detected Ankara fauna, 14 species were added with this study and 14 species could not be detected. Species that cannot be detected are shown in Table 4.

Meloidae fauna similarity between the detected in this study and recorded in the current literature was compared (Figure 4, Table 5). Faunistic result of this study is the closest to faunistic data of Ankara in current litera-

Table 2. Male-female specimen numbers of detected species and code of collecting localities.

Species	Number of specimens	Locality Code
<i>Cerocoma (s.str.) bernhaueri</i> Pardo Alcaide, 1977	3 (2♂♂, 1♀)	15, 106, 114
<i>Cerocoma (s.str.) dahli</i> Kraatz, 1863	2 (2♀♀)	2
<i>Cerocoma (s.str.) schaefferi</i> (Linnaeus, 1758)	1 (1♂)	151
<i>Cerocoma (Meloides) longiseta</i> Turco & Bologna, 2011	5 (1♂, 4♀♀)	8, 16, 22, 43, 122
<i>Cerocoma (M.) turcica</i> Pardo Alcaide, 1977	1 (1♂)	178
<i>Cerocoma (Metacerocoma) ephesica</i> Reitter, 1885	8 (8♀♀)	138, 163, 164
<i>Alosimus armeniacus</i> (Faldermann, 1837)	118 (72♂♂, 46♀♀)	2, 3, 6, 14, 16, 17, 19, 20, 23, 36, 105, 111, 113, 116, 117, 125, 129
<i>Alosimus chalybaeus</i> (Tauscher, 1812)	176 (106♂♂, 70♀♀)	2, 3, 4, 6, 7, 11, 13, 14, 19, 20, 21, 23, 24, 27, 106, 109, 110, 111, 113, 115, 119, 122, 124
<i>Alosimus luteus</i> (Waltl, 1838)	1 (1♂)	5
<i>Alosimus marginicollis</i> (Haag-Rutenberg, 1880)	12 (6♂♂, 6♀♀)	3, 113
<i>Lydus turcicus</i> Kaszab, 1952	58 (36♂♂, 22♀♀)	24, 90, 118, 120, 133, 134, 136, 137, 139, 152, 171
<i>Lytta (s.str.) vesicatoria heydeni</i> Haag-Rutenberg, 1880	1 (1♀)	9
<i>Oenas crassicornis</i> Illiger, 1800	147 (68♂♂, 79♀♀)	41, 43, 47, 50, 57, 59, 60, 63, 71, 72, 73, 80, 139, 153, 159, 161, 162, 165, 169, 171, 173, 176, 178, 181, 185
<i>Teratolytta gentilis</i> (Frivaldszky, 1877)	1 (1♀)	-
<i>Teratolytta monticola</i> (Bologna, 2006)	1 (1♀)	108
<i>Actenodia confluens</i> (Reiche, 1866)	8 (3♂♂, 5♀♀)	55
<i>Hycleus polymorphus</i> (Pallas, 1771)	12 (9♂♂ 3♀♀)	36, 38, 51, 58, 88
<i>Hycleus scabiosae</i> (A.G. Olivier, 1811)	686 (331♂♂, 355♀♀)	18, 24, 26, 27, 28, 36, 37, 38, 39, 40, 42, 43, 45, 47, 51, 53, 55, 57, 58, 60, 61, 62, 63, 67, 69, 71, 75, 76, 77, 81, 82, 85, 88, 90, 91, 94, 99, 100, 102, 120, 121, 122, 124, 130, 131, 133, 134, 136, 141, 144, 152, 153, 154, 155, 159, 164, 165, 166, 167, 168, 170, 175, 176, 178, 186
<i>Hycleus sexmaculatus</i> (A. G. Olivier, 1811)	7 (4♂♂, 3♀♀)	55, 164, 184
<i>Hycleus zebratus</i> (Marseul, 1870)	53 (26♂♂, 27♀♀)	5, 37, 39, 124, 127, 130, 135, 162, 172, 176
<i>Mylabris (Eumylabris) calida</i> (Pallas, 1782)	11 (6♂♂, 5♀♀)	31, 88, 89, 96
<i>Mylabris (E.) cincta</i> A. G. Olivier, 1811	85 (42♂♂, 43♀♀)	31, 33, 37, 89, 98, 122, 144, 145

Table 2. Male-female specimen numbers of detected species and code of collecting localities. (Continued)

<i>Mylabris (E.) crocata</i> (Pallas, 1781)	79 (39♂♂, 40♀♀)	4, 24, 25, 49, 53, 88, 90, 91, 92, 126, 127, 130, 133, 135, 139, 141, 142, 143
<i>Mylabris (E.) fabricii</i> Sumakov, 1924	117 (61♂♂, 56♀♀)	24, 25, 31, 32, 33, 36, 37, 38, 39, 46, 48, 70, 78, 88, 89, 90, 91, 96, 97, 179
<i>Mylabris (Micrabris) geminata</i> Fabricius, 1798	47 (21♂♂, 26♀♀)	57, 101, 129, 140, 147, 152, 153, 154, 155, 162
<i>Mylabris (M.) laevicollis</i> Marseul, 1870	99 (41♂♂, 58♀♀)	149, 150, 151, 163
<i>Mylabris (M.) unicolor</i> Faldermann, 1837	3 (2♂♂, 1♀)	134
<i>Mylabris (s.str.) olivieri</i> Billberg, 1813	135 (46♂♂, 89♀♀)	34, 51, 52, 88, 94, 100, 144, 152, 155, 164, 178
<i>Mylabris (s.str.) quadripunctata</i> (Linnaeus, 1767)	1129 (541♂♂, 588♀♀)	24, 25, 28, 29, 32, 34, 36, 37, 38, 39, 40, 43, 44, 45, 46, 48, 51, 53, 54, 57, 60, 63, 64, 68, 69, 77, 78, 83, 86, 88, 89, 90, 91, 93, 94, 95, 96, 97, 119, 120, 122, 123, 124, 127, 128, 130, 133, 134, 135, 136, 137, 139, 141, 144, 145, 146, 152, 153, 155, 156, 157, 158, 159, 160, 162, 163, 164, 167, 170, 171, 174, 176, 178, 183
<i>Mylabris (s.str.) variabilis</i> (Pallas, 1782)	100 (51♂♂, 49♀♀)	34, 36, 37, 74, 86, 150, 162
<i>Meloe (Eurymeloe) glazunovi</i> Pliginskij, 1910	1 (1♂)	104
<i>Meloe (E.) mediterraneus</i> J. Müller, 1925	2 (2♂♂)	1, 103
<i>Meloe (s.str.) proscarabaeus</i> Linnaeus, 1758	1 (1♀)	112
<i>Euzonitis quadrimaculata</i> (Pallas, 1782)	2 (2♀♀)	37
<i>Euzonitis rubida</i> (Ménétriés, 1832)	1 (1♂)	122
<i>Euzonitis sexmaculata</i> (A. G. Olivier, 1789)	7 (3♂♂, 4♀♀)	36, 37, 40, 137
<i>Nemognatha chrysomelina</i> (Fabricius, 1775)	42 (16♂♂, 26♀♀)	24, 60, 62, 63, 65, 66, 72, 75, 79, 87, 164, 165, 175, 176, 177, 180, 183, 187, 188, 189
<i>Stenoria (s.str.) apicalis</i> (Latreille, 1804)	1 (1♀)	84
<i>Zonitis (s.str.) flava</i> Fabricius, 1775	8 (6♂♂, 2♀♀)	30, 39, 56, 148, 159, 163, 182
<i>Zonitis (s.str.) immaculata</i> (A. G. Olivier, 1789)	30 (17♂♂, 13♀♀)	12, 35, 46, 47, 132
<i>Zonitis (s.str.) nana</i> Ragusa, 1881	1 (1♀)	127
<i>Stenoderia (s.str.) caucasica</i> (Pallas, 1781)	2 (2♀♀)	107, 139
<i>Stenoderia (Stenoderina) anatolica</i> (J. Frivaldszky, 1884)	1 (1♀)	10

Table 3. According to districts and geographical sections, number of species, specimen and singletons, and species diversity determined using the Brillouin diversity index (S: Singleton values, these values represent the number of species with only one specimen in samples).

District and Sections	No. of species	No. of specimens	S	Diversity	District and Sections	No. of species	No. of specimens	S	Diversity
Akyurt	7	178	2	1.241	Gölbaşı	10	115	4	1.471
Ayaş	12	106	4	1.817	Güdül	3	69	0	0.467
Bala	20	631	4	1.479	Haymana	16	389	7	1.781
Beypazarı	9	84	2	1.342	Kalecik	8	55	2	1.182
Central	15	358	2	1.897	Kazan	12	338	6	1.531
Çamlidere	1	1	1	0	Kızılcahamam	8	123	3	0.704
Çubuk	10	45	4	1.306	Nallıhan	12	212	5	1.559
Elmadag	3	22	1	0.591	Polatlı	18	343	5	1.562
Evren	4	8	3	0.727	Şereflikoçhisar	13	253	4	1.629
Upper Sakarya Section	37	2097	11	2.217	Konya Section	12	250	3	1.614
Western Black Sea Section	12	280	3	1.545	Middle Kızılırmak Section	23	703	6	1.654

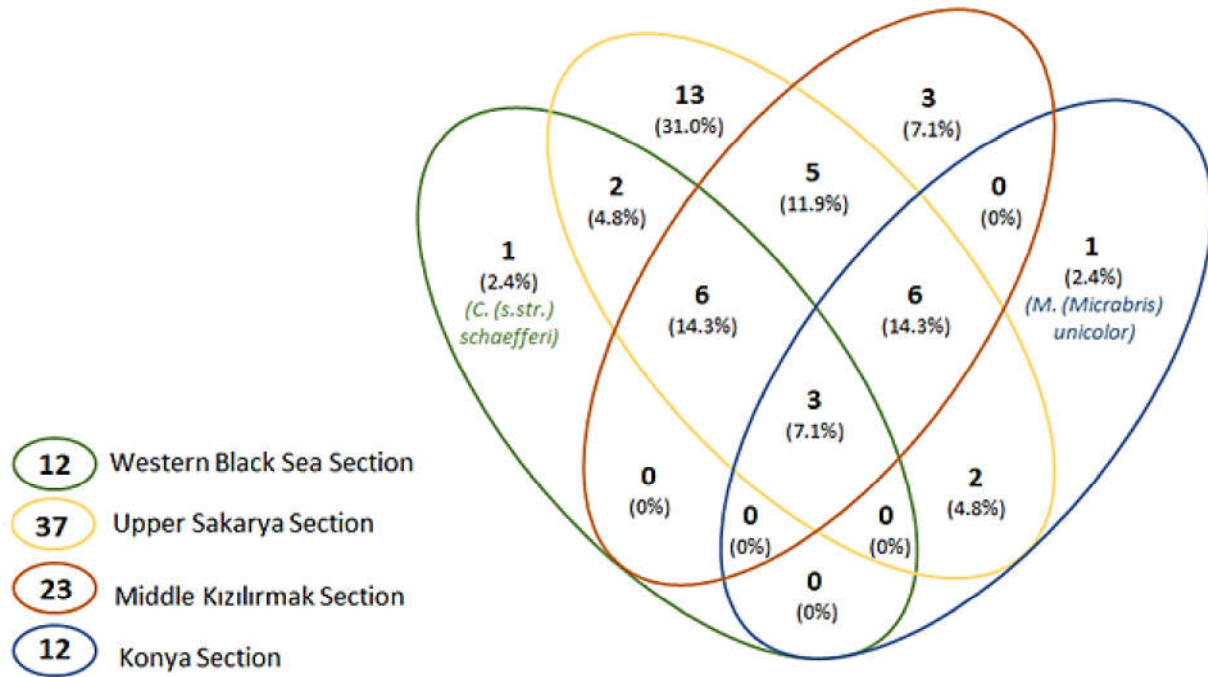


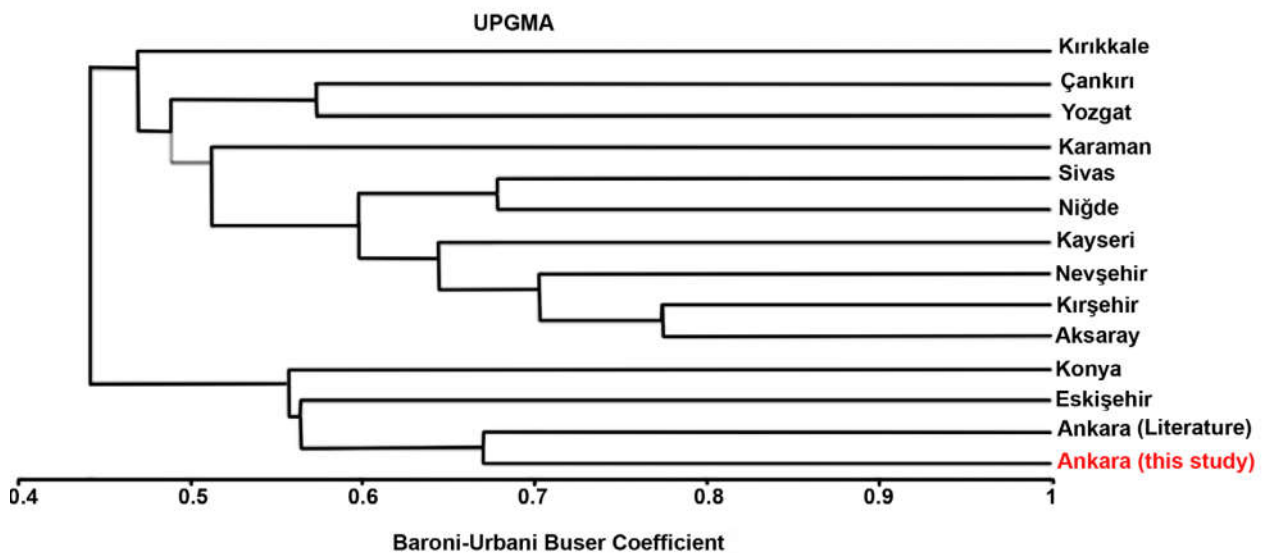
Figure 3. Turkey's geographical sections, remaining within the boundaries of Ankara, species richness of geographic sections and the number of species shared between these sections.

Table 4. Undetermined species, which are present in the current literature, in the scope of this study.

	Species	Literature		Species	Literature
1	<i>Cerocoma (Meloides) macedonica</i> Mañan, 1944	[47, 48]	8	<i>Mylabris (Mylabris) concolor</i> Marseul, 1870	[50]
2	<i>Cerocoma (M.) muehlfeldi</i> Gyllenhal, 1817	[5, 17, 49]	9	<i>Mylabris (M.) emiliae</i> (Escherich, 1899)	[51]
3	<i>Cerocoma (Mesocercocoma) scovitzi</i> Faldermann, 1837	[17, 48, 49]	10	<i>Meloe (Lasiomeloe) oliveri</i> Chevrolat, 1833	[19, 27, 52-54]
4	<i>Cerocoma (Metacercocoma) schreberi</i> Fabricius, 1781	[49]	11	<i>Meloe (L.) hungarus</i> Schrank, 1776	[7]
5	<i>Lydus trimaculatus</i> Fabricius, 1775	[7]	12	<i>Meloe (Taphromeloe) erythrocnemus</i> Pallas, 1782	[7, 11]
6	<i>Muzimes collaris</i> (Fabricius, 1787)	[7]	13	<i>Zonitis (Zonitis) microcephala</i> Escherich, 1897	[28]
7	<i>Mylabris (Chalcabris) munda</i> (Escherich, 1897)	[49]	14	<i>Zonitis (Z.) ruficollis</i> Frivaldsky, 1877	[19]

Table 5. Undetermined species, which are present in the current literature, in the scope of this study.

Number of species	43	8	43	14	4	9	37	17	24	15	30	16	10	7
	Ankara (this study)	Aksaray	Ankara (literature)	Kayseri	Kırıkkale	Kırşehir	Konya	Nevşehir	Niğde	Yozgat	Eskişehir	Sivas	Karaman	Çankırı
Ankara (this study)	1													
Aksaray	0.39	1												
Ankara (literature)	0.67	0.43	1											
Kayseri	0.35	0.75	0.42	1										
Kırıkkale	0.20	0.49	0.25	0.61	1									
Kırşehir	0.42	0.77	0.42	0.59	0.46	1								
Konya	0.48	0.44	0.65	0.53	0.29	0.43	1							
Nevşehir	0.55	0.74	0.55	0.60	0.34	0.67	0.57	1						
Niğde	0.56	0.57	0.54	0.55	0.36	0.60	0.47	0.64	1					
Yozgat	0.49	0.48	0.46	0.41	0.46	0.60	0.33	0.44	0.55	1				
Eskişehir	0.53	0.57	0.60	0.55	0.36	0.51	0.55	0.62	0.58	0.48	1			
Sivas	0.39	0.62	0.46	0.60	0.55	0.60	0.54	0.60	0.68	0.50	0.55	1		
Karaman	0.34	0.59	0.41	0.41	0.44	0.48	0.46	0.59	0.49	0.45	0.41	0.52	1	
Çankırı	0.32	0.42	0.32	0.46	0.52	0.54	0.41	0.50	0.40	0.57	0.39	0.57	0.51	1

**Figure 4.** Dendrogram showing of the comparison between detected fauna and current literature by using the Baroni-Urbani Buser similarity index.

ture (67%). While it is the furthest to Meloidae fauna of Kırıkkale province (20%).

DISCUSSION

As a result of this study, we can state that Ankara has rich Meloidae fauna with the result of this study and literature (57 species) and its fauna is 32.2% of Turkish fauna.

Evaluation of faunistic results exhibits that, ecological characteristics of Bala, Polatlı and Haymana districts such as vegetation, elevation, air temperature are supposed to be more suitable for species of Meloidae family compared to other districts. Field studies observations also support this situation. As a reason, it is thought that more homogeneous distribution may be an impressive factor in the number of identified species and samples compared to Bala, Polatlı and Haymana districts. In addition, the northern districts (eg. Çamlıdere, Güdül, Kızılcahamam and Elmadag), which are moist and rainy regions with forest vegetation, are lower in species diversity than the southern districts having steppe vegetation, represented by arid and terrestrial climate (Table 3).

Ankara is located at the intersection point of four geographical sections of Turkey and Meloidae faunas of these sections were examined separately. Although size of the study area and the number of locations may affect, it is thought that these sections are different in terms of their ecological characteristics such as climate, vegetation etc. affecting the species composition. Western Black Sea section high altitude, forest area and abundant rainfall; Konya Section is thought to be the driest section of Turkey and the Tuz Lake in this section has a negative effect on fauna. In addition, it is seen that the Konya and Western Black Sea sections contain only 1 special species, while the Middle Kızılırmak section contains 3 species (Figure 3).

According to the current literature, Meloidae fauna of Ankara province is represented by 43 species, [5, 7, 10, 11, 16, 17, 19, 28, 31, 32, 38, 47-51, 53-58], and 43 species were identified in this study, but it was observed that the species compositions were different. While 29 (67.4%) of the detected species were registered in Ankara fauna in the current literature, 14 species were registered for the first time. These species are *Cerocomia* (s.str.) *bernhaueri*, *Alosimus luteus*, *Teratolytta*

gentilis, *T. monticola*, *Hycleus polymorphus*, *H. sexmaculatus*, *Mylabris* (*Micrabris*) *laevicollis* Marseul, 1870, *M. (Micrabris) unicolor*, *Meloe* (*Eurymeloe*) *glazunovi*, *M. (Eurymeloe) mediterraneus*, *Euzonitis rubida*, *Stenoria* (s.str.) *apicalis*, *Zonitis* (s.str.) *flava* Fabricius, 1775 and *Z. (s.str.) nana*. As a result of the comparison of Meloidae fauna similarity between Ankara and other Central Anatolian provinces, it was found that the detected fauna overlaps with the current literature (with 67%) (Figure 4, Table 5). In addition, it is thought that the species registered long years ago may be negatively affected by urbanization, population growth and industrialization, besides it is thought that the species may be also negatively affected by factors such as global climate change and destruction or extinction of habitats. For example, *Mylabris munda* and *Zonitis microcephala* were identified by Escherich [49] as new species from Ankara. However, these species which were endemic to Turkey weren't detected in any other study. Unfortunately, their habitats may have narrowed, disappeared or species may have been distributed to another area due to urbanization and climate change. Also, in the current literature, no information about the phenology of these species has been found. Perhaps if they are active in a very short time, it may not have been found. In this study, *Lydus trimaculatus* Fabricius, 1775 detected by Özbek and Szaloki [7] from Ankara could not be found, but *Lydus turcicus* Kaszab, 1952 was found. In the current literature [5, 36], it is reported that *L. trimaculatus*, *L. quadrimaculatus* Tauscher, 1812 and *L. turcicus* species can be confused with each other. In this study, 58 specimens from different areas of Ankara were collected and as a result of the examinations, it was determined as *L. turcicus*.

In addition, we added 14 species to Meloidae fauna of Ankara with this study and species numbers to 57 and 32.56% has been contributed to the number of species in the current literature. The current literature exhibited that, quite a few species are given from some provinces of Central Anatolian Region (Aksaray, Çankırı, Karaman, Kırıkkale, Kırşehir) The possible reason of this can be lack of enough comprehensive study on the Meloidae family in these provinces. Considering the results obtained from this study, it is thought that possible future studies will fill this gap in this region.

Approximately 24.3% of Turkish Meloidae fauna were detected in this study. Considering the current literature data for Ankara Meloidae fauna, it is thought that it

would not be wrong to state that it has a rich composition in accordance with the habitat diversity within the provincial boundaries. It would be correct to adopt a habitat conservation approach, as it is not possible to protect species separately as for insects in general.

Turco and Bologna [17] stated that *Cerocoma* (s.str.) *bernhaueri* and *C.* (s.str.) *dahli* Kraatz, 1863, which is morphologically similar to each other, was very confused with each other in the past. It was also stated these species slightly overlapping in SE Turkey and NW Iran, and *C. bernhaueri* being a more eastern faunal element. In this study, samples were carefully examined according to taxonomic characters and diagnostic key [17], and it was determined that both species were found in the study area. This is very important in terms of information about the distributions of these species. Similarly, another species with an eastern element, *Alosimus luteus*, were recorded only in Southeastern Anatolian and Eastern Anatolian region of Turkey, according to current literature [5, 7, 58, 59]. In this study, detection of this species from the Central Anatolian Region showed that it is most western distributed in the Palaearctic region.

Teratolytta monticola Bologna, 2006 was defined at high altitudes (1854-2400m) in Erzurum (Turkey) [39]. The name of the species is due to its adaptation to the mountain habitat [39]. With this study, the detection of this species from Ankara reveals that it is not endemic to high altitude and Erzurum, but may have a wider distribution. However, it should not be neglected that the genus *Teratolytta* has high sexual dimorphism, and was not examined male specimens in this study, perhaps this sample may belong to new taxon or variation of another taxon. Since the diagnostic keys and definitions in the current literature [15, 39] point to *Teratolytta monticola*, in this study is given as this species. However, in the future, it is thought that this situation can definitely be clarified with male individuals who will gather from this area.

Additionally, *Mylabris* (*Micrabris*) *unicolor* and *Stenoria* (s.str.) *apicalis* detailed information about localities in Turkey are given for the first time in this study.

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