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Contributions to the Scorpions of the Bolkar Mountains (Turkey)

Bolkar Dağları (Türkiye) Akreplerine Katkılar

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Scorpiones, *Bolkar dağları*, *Escorpiidae*, *Luridae*, *Scorpionidae*, *Buthidae*

ABSTRACT

Bolkar Mountains that is mountain group located between Inner Anatolia and Mediterranean region in the city borders of Niğde, Adana, Karaman, Konya and Mersin Provinces. 151 scorpion samples collected from 31 different localities from July to September in 2010. As a result of the evaluation of samples of terrain, 18 *Euscorpium koci* samples from Euscorpiidae; 113 *Aegaeobuthus gibbosus* samples from Buthidae (88 adult); 13 *Protoiurus asiaticus* samples from Luridae and 7 *Scorpio fuscus* samples from Scorpionidae were determined. Finally, this study gave information about systematics, morphological characteristics and bioecological observation of scorpions distributed in Bolkar Mountains.

Öz

Bolkar Dağları, Akdeniz ve İç Anadolu Bölgeleri arasında ve Niğde, Adana, Karaman, Konya ve Mersin il sınırları içinde yer alan Orta Toroslar'ın oluşturduğu dağ grubudur. 2010 yılı Temmuz-Eylül ayları arasında 31 farklı lokaliteden 151 akrep örneği toplanmıştır. Araziden elde edilen örneklerin değerlendirilmesi sonucu Euscorpiidae'ye ait 18 örneğin *Euscorpium koci*; Buthidae'den 88'i ergin olmak üzere 113 örneğin *Aegaeobuthus gibbosus*; Luridae'den 13 örneğin *Protoiurus asiaticus* ve Scorpionidae'den 7 örneğin *Scorpio fuscus* olduğu belirlenmiştir. Elde edilen veriler doğrultusunda, Bolkar Dağları'nda dağılım gösteren akrep türlerinin sistematikleri, morfolojik ve morfometrik özellikleri ile her türe ait biyo-ekolojik gözlemler hakkında bilgi verilmesi hedeflenmektedir.

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1. INTRODUCTION

The distribution of scorpions in rural area of Anatolia isn't homogenous due to natural barriers, climatic conditions, deforestations and human impacts on ecosystems (Crucitti, 1999). Anatolian diagonal is an important natural barrier that divides Anatolia into two different faunal and climatic regions. Anatolian diagonal across from the Bolkar Mountains to south of Gümüşhane and Bayburt. Anatolian diagonal effects species distribution (Vachon, 1951; Çiplak, 2004; Mutun, 2010). However, the distributions of scorpion existed due to genetic isolation and geographic separation throughout the post glacial periods in arid, semi-arid and rural areas The current

distributions of scorpion are considered in four group as Aegean-Mediterranean region, Central Asia region, Sahoro-Sindian region and European-Mediterranean region. The scorpion taxon of Aegean-Mediterranean region could be explaining by the distribution of *Iurus* Thorell, 1876 and *Calchas* Birula, 1899. The scorpion taxon of Central Asian region could be explaining by the distribution of *Mesobuthus* Vachon, 1950. The scorpion taxon of Sahoro-Sindian region could be explaining by the distribution of *Androctonus* Ehrenberg, 1828, *Compsobuthus* Vachon, 1929, *Scorpio* Linnaeus, 1758 and *Leiurus* Ehrenberg, 1828. Finally, the scorpion taxon of European-Mediterranean region could be explained by

the distribution of *Euscorpium* Thorell, 1876 (Crucitti, 1999).

The altitude variations in short distance in Bolkar Mountains leads to be formation microhabitats, so species diversity is expected to be high. There is no detailed study in Bolkar Mountains except Kovarik et al. (2010). Therefore, the Bolkar Mountain was chosen as study area and it is aimed to give information about morphological features of scorpions and scorpiofauna of Bolkar mountain.

2. MATERIALS AND METHODS

151 scorpion samples collected from 31 different localities in Niğde (Ulukışla), Konya (Halkapınar), Mersin (Silifke, Erdemli, Tarsus, Çamlıyayla), Karaman (Merkez,

Ayrancı) district, from July to September, 2010 (Table 1). Samples collected by ultraviolet light source throughout the night, but sometimes samples collected from undersides of stones. Samples were collected with forceps and taken into glass containers containing 70% alcohol. GPS coordinated of samples recorded via Garmin Etrex Vista HXC (Table 1). The voucher specimens deposited in Zoology Museum of Biology Department of Niğde Ömer Halisdemir University. Morphometric measurements (Figure 1) performed according to Stahnke (1970) and Sissom et al. (1990) and evaluation of trichobotria features were determined according to Polis (1990). The photographs of samples were taken with Olympus C5060. Statistical data obtained in Microsoft Office Excel, 2010.

Table 1. The localities, coordinates, altitude information of scorpion samples.

No	Species	Localities	Coordinates	Altitude	Number of Sampling
1	<i>Aegaeobuthus gibbosus</i>	Niğde/Ulukışla-Emirler district	N: 37° 28.801' E: 34° 33.574'	1538 m	2
2	<i>Aegaeobuthus gibbosus</i>	Niğde/Ulukışla-Darboğaz district	N: 37° 26.143' E: 34° 26.698'	1517 m	3
3	<i>Aegaeobuthus gibbosus</i>	Niğde/Ulukışla-Klan district	N: 36° 26.660' E: 34° 26.724'	2034 m	1
4	<i>Aegaeobuthus gibbosus</i>	Niğde/Ulukışla-Klan, Yazıbil district	N: 37° 26.129' E: 34° 26.698'	2034 m	5
5	<i>Aegaeobuthus gibbosus</i>	Konya/Halkapınar-Çakıllar district	N: 37° 24.344' E: 34° 18.388'	1383 m	12
6	<i>Aegaeobuthus gibbosus</i>	Konya/Halkapınar-Kayasaray district	N: 37° 22.344' E: 34° 16.110'	1500 m	3
7	<i>Aegaeobuthus gibbosus</i>	Konya/Halkapınar-Yayıklı district	N: 37° 25.647' E: 34° 13.510'	1450 m	1
8	<i>Aegaeobuthus gibbosus</i>	Karaman/Ayrancı-Berendi district	N: 37° 16.388' E: 34° 03.150'	1682 m	3
9	<i>Aegaeobuthus gibbosus</i>	Karaman/Ayrancı-Berendi, Yağlıdere district	N: 37° 17.289' E: 34° 01.956'	1730 m	1
10	<i>Aegaeobuthus gibbosus</i>	Karaman/Ayrancı-Kıraman village	N: 37° 15.484' E: 33° 55.458'	1406 m	1
11	<i>Aegaeobuthus gibbosus</i>	Karaman/Güldere-Gödet district	N: 37° 03.387' E: 33° 29.260'	1323 m	1
12	<i>Aegaeobuthus gibbosus</i>	Karaman/Ayrancı-Büyükoraş district	N: 37° 07.415' E: 33° 42.979'	1536 m	2
13	<i>Aegaeobuthus gibbosus</i>	Mersin/Silifke-Kırobası district	N: 36° 42' 491 E: 33° 52' 798	1421 m	3
14	<i>Aegaeobuthus gibbosus</i>	Mersin/Silifke-Kavak district	N: 36° 42.596' E: 33° 43.381'	1310 m	1
15	<i>Aegaeobuthus gibbosus</i>	Mersin/Silifke-Sarıaydın district	N: 36° 45.737' E: 33° 54.954'	1370 m	10
16	<i>Aegaeobuthus gibbosus</i>	Mersin/Silifke-Seydili district	N: 36° 38.106' E: 35° 58.808'	1245 m	10
17	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Kayacı district	N: 36° 45.475' E: 34° 10.291'	1663 m	3
18	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Cercili district	N: 36° 41.143' E: 34° 26.998'	1210 m	4

19	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Toros district	N: 36° 50.551' E: 34° 07.089'	1761 m	12
20	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Hacıalan district	N: 36° 50.373' E: 34° 11.013'	1381 m	3
21	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Cacık district	N: 36° 54.647' E: 34° 12.510'	1800 m	2
22	<i>Aegaeobuthus gibbosus</i>	Mersin/Erdemli-Deliali district	N: 36° 45.010' E: 34° 15.146'	1030 m	5
23	<i>Aegaeobuthus gibbosus</i>	Mersin/Güzelyayla district	N: 37° 00.091' E: 34° 29.556'	1157 m	4
24	<i>Aegaeobuthus gibbosus</i>	Mersin/Kızılkaya district	N: 37° 05.045' E: 34° 31.956'	1153 m	9
25	<i>Aegaeobuthus gibbosus</i>	Mersin/Uzuncaburç district	N: 36° 33.116' E: 33° 56.430'	1101 m	12
26	<i>Protoiurus asiaticus</i>	Mersin/Erdemli-Cercilli district	N: 36° 41.143' E: 34° 26.698'	1210 m	3
27	<i>Protoiurus asiaticus</i>	Mersin/Erdemli-Toros district	N: 36° 50.551' E: 34° 07.089'	1761 m	1
28	<i>Protoiurus asiaticus</i>	Mersin/Gülek district	N: 37° 03.387' E: 33° 29.260'	1323 m	3
29	<i>Protoiurus asiaticus</i>	Mersin/Gözne district	N: 36° 59.917' E: 34° 34.260'	1073 m	1
30	<i>Protoiurus asiaticus</i>	Mersin/Çamlıyayla district	N: 37° 11.552' E: 33° 52.798'	1088 m	1
31	<i>Protoiurus asiaticus</i>	Mersin/Tarsus-Taşobası district	N: 37° 05.486' E: 34° 55.836'	254 m	1
32	<i>Protoiurus asiaticus</i>	Niğde/Horoz district	N: 37° 28.689' E: 34° 46.930'	1310 m	3
33	<i>Euscorpius koci</i>	Mersin/Silifke-Sarıaydın district	N: 36° 45.737' E: 33° 54.954'	1370 m	2
34	<i>Euscorpius koci</i>	Mersin/Erdemli-Cercilli district	N: 36° 41.143' E: 34° 26.698'	1210 m	8
35	<i>Euscorpius koci</i>	Mersin/Erdemli-Toros district	N: 36° 50.551' E: 34° 07.089'	1761 m	8
36	<i>Scorpio fuscus</i>	Mersin/Güzelyayla district	N: 37° 00.091' E: 34° 29.556'	1157 m	2
37	<i>Scorpio fuscus</i>	Mersin/Kızılkaya district	N: 37° 05.045' E: 34° 31.956'	1153 m	3
38	<i>Scorpio fuscus</i>	Mersin/Arslanköy district	N: 37° 01.134' E: 33° 16.876'	1500 m	2

3. RESULTS

Familia 1: Buthidae C.L.Koch, 1837

Genus: *Aegaeobuthus* Kovarik, 2019

1950. Vachon, *Mesobuthus* Vachon, Archives de l'Institut Pasteur d'Algérie, 28 (2): 152-216.

Type species: *Androctonus eupeus* C.L.Koch, 1838 [= *Mesobuthus eupeus* (C.L.Koch, 1838)].

Aegaeobuthus gibbosus (Brullé, 1832)

1832. *Buthus gibbosus* Brullé, Section des sciences physiques, Zoologie, Paris, 3 (1): 57-60.

Terra-typica: Mora, Greece

1950. *Mesobuthus gibbosus* Vachon, Archives de l'Institut Pasteur d'Algérie, 28 (2): 152-216.

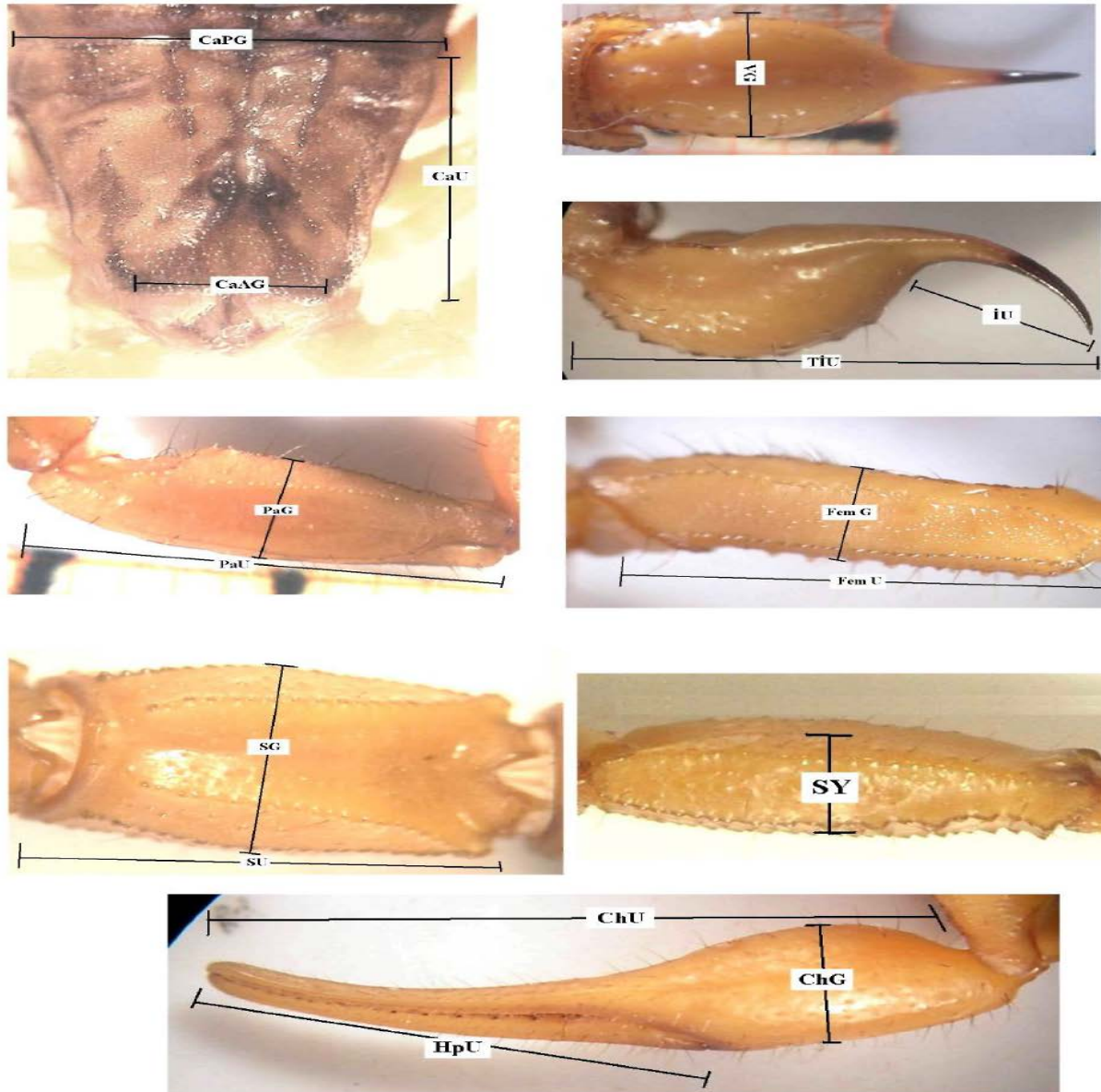


Figure 1. Morphometric characters that used in this study (CaPG: Carapace posterior weight; CaAG: Carapace anterior weight; CaU: Carapace length; VG: Vesicular length; TIU: Telson length; IU: Sting length; PaG: Patella weight; PaU: Patella length; FemG: Femur weight; FeU: Femur length; SG: Metasomal segment weight; SU: Metasomal segment length; SY: Metasomal segment height; ChG: Chela weight; ChU: Chela length; HpU: Chela movement finger length)

Distinguishing features: Yellowish brown. As, chela fixed finger carries distinct granules that divided into 11 rows, chela movable finger carries distinct granules that divided into 12 rows. Pectinate teeth, (left-right) 19-26 for female. Pectinate teeth, (left-right) 27-34 for male. Sexual dimorphism determined based on morphometric measurements (Table 2; Table 3).

Worldwide Distribution: Albania, Bulgaria, Greece, Macedonia, Serbia and Montenegro, Turkey (Francke, 1981; Froufe et al., 2008; Karataş & Çolak, 2005)

Turkey distribution: Western part of Anatolian Diagonal, Black sea region and most part of the Turkey except coastal region of Marmara Sea (Ubisch, 1922).

In this study: Niğde, Ulukışla district (Emirler, Darboğaz, Klan and Horoz part); Halkapınar district (Çakıllar, Kayasaray and Yayıklı part); Karaman, Ayrancı district (Berendi, Kıraman, Gödet and Büyükkoraş part); Mersin, Silifke district (Kırobası, Kavak, Sarıaydın and Seydili part); Mersin, Erdemli district (Kayacı, Cercili, Toros, Hacıalan,

Cacik part and Deliali plateau); Mersin district (Kızılkaya and Güzelyayla part).

Bio-ecological notes: *Aegaeobuthus gibbosus* was the most common species in field area. This species was observed in three different habitats as steppe, forest and stony area. They were hide themselves under the stones. Although scorpions are nocturnal (active during night time) organism, the female one was active day time Halkapınar district. Some samples (male and female) were collected from trunks of trees and shrubs. The morphometric evaluation indicated that the scorpion body length was over 70 mm in above 1100 m and also the highest body lengths were 80 mm, 81 mm, 83 mm, 84 mm in 1153m (Mersin/Kızılkaya district).

Table 2. The morphometric data of adult female individuals of *Aegaeobuthus gibbosus* (n: number of individuals; std: Standard deviation value).

	n	mean	Std
Body length	39 ♀♀	65,00	± 1,64
Ca U/G	39 ♀♀	0,90	± 0,01
Seg I U/G	39 ♀♀	1,05	± 0,01
Seg II U/G	39 ♀♀	1,25	± 0,01
Seg III U/G	39 ♀♀	1,39	± 0,02
Seg IV U/G	39 ♀♀	1,68	± 0,02
Seg V U/G	39 ♀♀	2,15	± 0,02
Ch U	39 ♀♀	11,97	± 0,29
Ch G	39 ♀♀	2,60	± 0,07
Ch D	39 ♀♀	2,51	± 0,08
HpU	39 ♀♀	7,42	± 0,15
Fem U/G	39 ♀♀	3,20	± 0,04
Pat. U/G	39 ♀♀	2,756	± 0,04
TiU	39 ♀♀	6,44	± 0,24
VG	39 ♀♀	2,80	± 0,09
VD	39 ♀♀	2,68	± 0,08
iU	39 ♀♀	3,05	± 0,07
Pectinate teeth	39 ♀♀	19-26	--

Table 3. The morphometric data of adult male individuals of *Aegaeobuthus gibbosus* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std.
Body length	49 ♂♂	65,26	± 1,29
Ca U/G	49 ♂♂	0,93	± 0,004
Seg I U/G	49 ♂♂	1,18	± 0,01
Seg II U/G	49 ♂♂	1,44	± 0,01
Seg III U/G	49 ♂♂	1,58	± 0,02
Seg IV U/G	49 ♂♂	1,90	± 0,03
Seg V U/G	49 ♂♂	2,42	± 0,02
Ch U	49 ♂♂	12,31	± 0,28
Ch G	49 ♂♂	2,69	± 0,06
Ch D	49 ♂♂	2,59	± 0,06
HpU	49 ♂♂	7,33	± 0,13
Fem U/G	49 ♂♂	3,50	± 0,09
Pat. U/G	49 ♂♂	3,00	± 0,04
TiU	49 ♂♂	6,58	± 0,13
VG	49 ♂♂	2,56	± 0,56
VD	49 ♂♂	2,49	± 0,05
iU	49 ♂♂	2,87	± 0,06
Pectinate teeth	49 ♂♂	27-34	--

Familia 2: Scorpionidae Latreille, 1802

Genus: *Scorpio* Linnaeus, 1758

1758. *Scorpio* Linnaeus, Holmiae (Stockholm): Laurentii Salvi, 1, p. 624.

Type species: *Scorpio maurus* Linnaeus, 1758

Scorpio fuscus (Ehrenberg, 1829)

1758. *Scorpio maurus* Linnaeus, Holmiae (Stockholm): Laurentii Salvi, 1, p. 624.

Terra typica: Africa

Distinguishing features: Dark brown. Chela movable and fixed fingers are blunt and chela manus is globular. Sternum pentagonal, femur carries 3-4 trichobotria and one of the trichobotria located dorsally. Pectinate teeth, (left-right) 9-11 for female. Pectinate teeth, (left-right) 10-10 and 13-13 for male. Sexual dimorphism determined based on morphometric measurements (Table 4; Table 5).

Worldwide Distribution: Algeria, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Libya, Morocco, Saudi Arabia, Senegal, Syria, Tunisia, Turkey, Yemen (Birula, 1898; Kovarik et al., 2010)

Turkey distribution: The region from Elazığ to Mersin and Amonos mountain and the region from Adıyaman/Sincik district to Hatay/İskenderun district (Birula, 1898; Crucitti, 1999; Karataş & Çolak, 2005).

In this study: Mersin/Kızılkaya, Güzelyayla and Arslanköy district.

Bio-ecological notes: *Scorpio fuscus* just observed during night time on stones as active. Although, *Aegaeobuthus gibbosus*, *Euscropius koci* and *Protoiurus asiaticus* members didn't harm each other when they brought together, *Scorpio maurus* members showed aggressive behavior and killed each other short after brought together.

Table 4. The morphometric data of adult female individuals of *Scorpio fuscus* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std
Body length	5 ♀♀	65,40	± 3,35
Ca U/G	5 ♀♀	0,93	± 0,01
Seg I U/G	5 ♀♀	0,70	± 0,02
Seg II U/G	5 ♀♀	0,90	± 0,01
Seg III U/G	5 ♀♀	1,08	± 0,01
Seg IV U/G	5 ♀♀	1,45	± 0,04
Seg V U/G	5 ♀♀	2,15	± 0,03
Ch U	5 ♀♀	16	± 0,63
Ch G	5 ♀♀	7,78	± 0,24
Ch D	5 ♀♀	7,62	± 0,24
HpU	5 ♀♀	8,76	± 0,18
Fem U/G	5 ♀♀	2,01	± 0,07
Pat. U/G	5 ♀♀	2,00	± 0,07
TiU	5 ♀♀	6,36	± 0,23
VG	5 ♀♀	3,16	± 0,12
VD	5 ♀♀	3,06	± 0,12
iU	5 ♀♀	2,50	± 0,05
Pectinate teeth	4 ♀♀	9-9, 11-9, 11-10, 11-11	--

Table 5. The morphometric data of two adult male individuals of *Scorpio fuscus* (n: number of individuals; Std: Standard deviation value).

	n	Sample I	Sample II
Body length	2 ♂♂	62	61
Ca U/G	2 ♂♂	0,91	0,96
Seg I U/G	2 ♂♂	0,82	0,83
Seg II U/G	2 ♂♂	1,02	1,00
Seg III U/G	2 ♂♂	1,13	1,67
Seg IV U/G	2 ♂♂	1,47	1,48
Seg V U/G	2 ♂♂	1,70	2,11
Ch U	2 ♂♂	14,00	16,00
Ch G	2 ♂♂	8,20	8,20
Ch D	2 ♂♂	8,00	8,00
HpU	2 ♂♂	7,50	8,00
Fem U/G	2 ♂♂	2,11	1,93
Pat. U/G	2 ♂♂	2,03	1,81
TiU	2 ♂♂	6,50	-
VG	2 ♂♂	2,50	-
VD	2 ♂♂	3,30	3,10
iU	2 ♂♂	3,20	3,00
Pectinate teeth	2 ♂♂	10-10	13-13

Familia 3: Iuridae Thorell, 1876

Genus: Protoiurus Sölegrad, Fet, Kovařík & Yağmur, 2012

1876. *Iurus* Thorell, Annals and Magazine of Natural History, 4 (17): 1-15.

Type species: *Iurus granulatus* (C.L.Koch, 1837) [=Iurus dufourei (Brullé, 1832)].

Protoiurus asiaticus Birula, 1903

1832. *Iurus dufourei asiaticus* Brullé, Section des sciences physiques, zoologie, Paris, 3(1): 57-60.

1903. *Iurus asiaticus* Francke, Journal of Arachnology, 9: 233-258.

Terra typica: Gülek, Turkey.

Distinguishing features: Blackish brown. Pectine teeth, left 10 and right 14 for female. Pectinate teeth, left 10 and right 16 for male. There are three lateral eyes on both side of carapace. Chela depth/length (Ch D/U) ratio is 0.32-0.35 for male and 0.32-0.34 for female. Pectinate teeth, (left-right) 10-19, 10-11 and 12-12 for male. Pectinate teeth, (left-right) 11-11, 12-11, 12-12 and 13-13 for female. Sexual dimorphism determined based on morphometric measurements (Table 6; Table 7).

Worldwide Distribution: The Northwest part of Mediterranean, South part of Greece, Southwest part of Turkey, the islands in Aegean Sea (Levy & Amitai, 1980; Birula, 1903; Kovarik et al., 2010)

Turkey distribution: Adana, Adıyaman, Kahramanmaraş, Mersin and Niğde district (Kovarik et al., 2010, Soleglad et al., 2012)

In this study: Mersin/Tarsus, Taşobası, Gülek, Çamlıyayla, Erdemli, Cercili, and Toros district and Niğde/Horoz district.

Bio-ecological notes: *Protoiurus asiaticus* was active during the night time, and they were observed generally on the rocky place.

Table 6. The morphometric data of adult female individuals of *Protoiurus asiaticus* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std
Body length	7 ♀♀	71,57	± 5,17
Ca U/G	7 ♀♀	0,95	± 0,03
Seg I U/G	7 ♀♀	0,78	± 0,02
Seg II U/G	7 ♀♀	0,96	± 0,03
Seg III U/G	7 ♀♀	1,16	± 0,03
Seg IV U/G	7 ♀♀	1,50	± 0,06
Seg V U/G	7 ♀♀	2,74	± 0,11
Ch U	7 ♀♀	19,71	± 1,23
Ch G	7 ♀♀	5,61	± 0,46
Ch D	7 ♀♀	5,44	± 0,44
HpU	7 ♀♀	11,51	± 0,86
Fem U/G	7 ♀♀	2,95	± 0,11
Pat. U/G	7 ♀♀	2,64	± 0,08
TiU	7 ♀♀	9,41	± 0,68
VG	7 ♀♀	2,88	± 0,86
VD	7 ♀♀	2,64	± 0,14
iU	7 ♀♀	2,54	± 0,14
Pectinate teeth	6 ♀♀	10-9 (2), 10-11 (3), 12-12 (1),	-

Table 7. The morphometric data of adult male individuals of *Protoiurus asiaticus* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std
Body length	6 ♂♂	73,16	± 1,79
Ca U/G	6 ♂♂	0,97	± 0,03
Seg I U/G	6 ♂♂	0,82	± 0,04
Seg II U/G	6 ♂♂	1,04	± 0,04
Seg III U/G	6 ♂♂	1,25	± 0,04
Seg IV U/G	6 ♂♂	1,60	± 0,07
Seg V U/G	6 ♂♂	2,94	± 0,07
Ch U	6 ♂♂	23,50	± 0,67
Ch G	6 ♂♂	7,50	± 0,24
Ch D	6 ♂♂	7,33	± 0,25
HpU	6 ♂♂	11,51	± 0,86
Fem U/G	6 ♂♂	3,11	± 0,17
Pat. U/G	6 ♂♂	2,56	± 0,06
TiU	4 ♂♂	11,72	± 0,97
VG	6 ♂♂	3,35	± 0,06
VD	6 ♂♂	3,56	± 0,12
iU	4 ♂♂	3,46	± 0,12
Pectinate teeth	6 ♂♂	11-11 (1), 12-11 (2), 12-12 (2), 13-13 (1)	-

Familia 4: Euscorpiidae Laurie, 1893

Genus: Euscorpius Thorell, 1876

1876. *Euscorpius* Thorell, Annals and Magazine of Natural History, 4 (17): 1-15.

Type species: *Scorpio carpathicus* Linneus, 1767 [*Euscorpius carpathicus* (Linneus, 1767)].

Euscorpius koci Tropea et Yağmur, 2015

Terra typica: Turkey

Distinguishing features: Yellowish brown. Trichobotria on ventral side of pedipalp patella (TV) is 7-9 (8). Trichobotria on the external surface of pedipalp patella; external median (em) is 4. Pectinate teeth, (left-right) 8-

10, 9-9, 9-10 and 10-10 for male. Pectinate teeth, (left-right) 7-7, 6-6, 8-8 and 8-9 for female. Sexual dimorphism determined based on morphometric measurements (Table 8; Table 9).

Worldwide Distribution: Southern Turkey (Tropea & Yağmur, 2015)

Turkey distribution: Mersin district (Tropea & Yağmur, 2015)

In this study: Mersin/Silifke and Erdemli district

Bio-ecological notes: *Euscorpium koci* observed undersides of stones during day time and they were active on the surface of rocky part of mountain during night time.

Table 8. The morphometric data of adult female individuals of *Euscorpium koci* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std
Body length	10 ♀♀	35,00	± 1,30
Ca U/G	10 ♀♀	0,91	± 0,02
Seg I U/G	10 ♀♀	0,98	± 0,03
Seg II U/G	10 ♀♀	1,25	± 0,03
Seg III U/G	10 ♀♀	1,71	± 0,11
Seg IV U/G	10 ♀♀	2,12	± 0,06
Seg V U/G	10 ♀♀	3,54	± 0,11
Ch U	10 ♀♀	6,03	± 0,19
Ch G	10 ♀♀	2,31	± 0,07
Ch D	10 ♀♀	2,10	± 0,07
HpU	10 ♀♀	3,19	± 0,15
Fem U/G	10 ♀♀	2,82	± 0,08
Pat. U/G	10 ♀♀	2,58	± 0,06
TiU	10 ♀♀	2,68	± 0,11
VG	10 ♀♀	0,91	± 0,05
VD	10 ♀♀	0,85	± 0,07
iU	10 ♀♀	0,90	± 0,04
Pectinate teeth	10 ♀♀	7-7 (8), 6-6 (1), 8-8 (1) 8-9 (1)	--

Table 9. The morphometric data of adult male individuals of *Euscorpium koci* (n: number of individuals; Std: Standard deviation value).

	n	mean	Std
Body length	8 ♂♂	32,5	± 1,63
Ca U/G	8 ♂♂	0,94	± 0,01
Seg I U/G	8 ♂♂	0,99	± 0,02
Seg II U/G	8 ♂♂	1,35	± 0,03
Seg III U/G	8 ♂♂	1,53	± 0,06
Seg IV U/G	8 ♂♂	2,34	± 0,09
Seg V U/G	8 ♂♂	3,81	± 0,12
Ch U	8 ♂♂	5,97	± 0,20
Ch G	8 ♂♂	2,37	± 0,07
Ch D	8 ♂♂	2,11	± 0,08
HpU	8 ♂♂	3,15	± 0,13
Fem U/G	8 ♂♂	2,86	± 0,07
Pat. U/G	8 ♂♂	2,63	± 0,05
TiU	8 ♂♂	3,32	± 0,07
VG	8 ♂♂	1,21	± 0,06
VD	8 ♂♂	1,20	± 0,04
iU	8 ♂♂	0,90	± 0,04
Pectinate teeth	8 ♂♂	8-10 (1), 9-9 (3), 9-10 (2) 10-10 (1)	--

4. DISCUSSIONS

This study conducted in Bolkar mountains from July to September, 2010 and four species determined from Buthidae, Euscorpidae, Iuridae and Scorpionidae. The postero-median and centro-median carina continues both side of carapace as characteristic features of *Mesobuthus gibbosus* (Karataş, 2007) but in this study some individuals' postero and centro-median carina continued on one side and didn't continue other side of carapace like *Mesobuthus nigrocintus*. *Scorpio maurus* divided into two subspecies as *Scorpio maurus fuscus* (Ehrenberg, 1829) and *Scorpio maurus palmatus* (Ehrenberg, 1829). *Scorpio maurus palmatus* has light coloured than *Scorpio maurus fuscus*. Although, pectinate teeth of *Scorpio maurus fuscus* is 9-11 for male and 6-10 for female, pectinate teeth of *Scorpio maurus palmatus* is 9-13 for male and 7-13 for female (Levy & Amitai, 1980). The samples collected from study area was dark colored and pectinate teeth was 13-13 and 10-10 for male individuals and 9-9, 11-9, 11-10 and 11-11 for female individuals. The *Scorpio* samples that collected from Bolkar mountain determined as *Scorpio maurus fuscus* as mentioned in Crucitti & Vignoli (2002), Fet & Braunwalder

(2000) and Karataş & Çolak (2005) studies. However, Talal et al. (2015) promoted *Scorpio maurus fuscus* to species level as *Scorpio fuscus*. I. metasomal segment of *Protoiurus asiaticus* is longer than its weight. Pectinate teeth is 10-13 for male and 9-12 for female. As, ChD/ChG (Chela depth/chela weight) ratio is 0.32-0.35 for male and 0.32-0.34, HpU/TG (movement length/telson weight) ratio is 3.77-4.02 for male and 3.99-4.08 for female (Kovarík et al., 2010). The characteristic features of *Protoiurus* samples that collected from study area as followed: I. metasomal segment was longer than its weight; pectinate teeth was 10-9, 10-11, 12-12 for female and 11-11, 12-12, 13-13 for male; ChD/ChG ratio was 0.31 for male and 0.27; HpU/TG ratio was 3.78 for male and 4.34 for female. These results indicated that the samples that collected during the study was *Protoiurus asiaticus*. Our findings were similar to the findings of *E. ciliciensis* and *E.koci* in the studies of Fet et al. (2016) and Tropea & Yağmur (2015). However, the study samples were similar with *E. koci* by em (external median trichobotria) with 4 trichobotria, et with 6 trichobotria and *Pv*: 8-9. However, *E.ciliciensis* distinguishing features are as follow: em: 3, et: 5 and *Pv*:7. Therefore, these samples were evaluated as *E.koci* (Fet et al., 2016; Tropea & Yağmur, 2015).

The findings indicated that the distribution of *Scorpio fuscus* and *Euscorpius koci* were limited. It is thought that the ecological tolerance of these species is narrow and therefore these two species should be protected and to understand their biology the more study should be perform.

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