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Research article/Araştırma makalesi

Wolf spiders (Araneae: Lycosidae) from Bursa and Balıkesir (Northwest Anatolia) in Turkey

Zeyhan UYAR [*1], Petr DOLEJŠ [2]

[1] Uludağ University, Science and Arts Faculty, Biology Department, Bursa, Turkey.
[2] National Museum – Natural History Museum, Department of Zoology, Prague, Czech Republic

Abstract

The investigation was carried out in Northwest Anatolia in the period 2006–2011. From 24 localities, 14 wolf spider species in six genera were reported. The species represent lowland as well as mountain spider fauna of the Palaearctic region. In this study, *Alopecosa farinosa, Aulonia albimana, Pardosa consimilis*, *Pardosa hortensis* and *Pardosa monticola* are the first records for Marmara region in Turkey. *Trabea paradoxa* is the first record for Anatolia.

Key words: Turkey, Asia Minor, fauna, inventory, wolf spider

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Türkiye'de Bursa ve Balıkesir'den (Kuzeybatı Anadolu) Kurt örümcekleri (Araneae: Lycosidae)

Özet

Araştırma, 2006–2011 yılları arasında Kuzeybatı Anadolu'da gerçekleştirilmiştir. 24 lokaliteden 6 cinse ait 14 türe ait kurt örümceği rapor edilmiştir. Türler, Paliarktik bölgedeki hem dağ örümceklerini hem de ova örümceklerini temsil eder. Bu çalışmada , *Alopecosa farinosa, Aulonia albimana, Pardosa consimilis*, *Pardosa hortensis* and *Pardosa monticola* Marmara bölgesi için ilk kayıtlardır. . *Trabea paradoxa* Anadolu için ilk kayıttır.

Anahtar kelimeler: Türkiye, Anadolu, fauna, envanter, kurt örümceği

1. Introduction

Turkey consists of two general parts, Thrace and Anatolia. Thrace is a European part of Turkey, Anatolia is the Asian part. From the geographical point of view, Turkey is divided into Marmara, Aegean, Black Sea, Central Anatolia, Eastern Anatolia, South-eastern Anatolia and Mediterranean. Turkey belongs to a zoogeographically very diversified area: Several zoogeographic zones overlap (European, Caucasian, Turanian and Eremial) (Gümuş and Neubert, 2009) and biodiversity hotspots meet (Caucasus, Irano-Anatolian and Mediterranean), including a high rate of endemism (Gür, 2016). The Turkish fauna has relationship to Palaearctic, central European, Mediterranean and also Gondwanian and Far East fauna (Kosswig, 1955). Therefore, Turkish spider fauna is very rich: To date, 1117 spider species belonging to 52 families have been reported in Turkey. The list is dominated by members of families Gnaphosidae (145 species), Salticidae (143 species) and Linyphiidae (128 species) (Demir and Seyyar, 2017). Lycosidae, a globally distributed family with 2421 species belonging to 123 genera (WSC, 2017), contains 87 species from 15 genera in Turkey (including two endemics, *Arctosa simoni* Guy, 1966 and *Pardosa ilgunensis* Nosek, 1905): *Allocosa* – 1, *Alopecosa* – 13, *Arctosa* – 10, *Aulonia* – 2, *Geolycosa* – 1, *Hogna* – 2, *Lycosa* – 5, *Ocyale* – 1, *Pardosa* – 37, *Pirata* – 2, *Piratula* – 4, *Trabea* – 1, *Trochosa* – 5, *Wadicosa* – 1 and *Xerolycosa* – 2 (Demir and Seyyar, 2017; Uyar and Dolejš, 2017). Here, for comparative purposes, we have provided data on the diversity of Lycosidae in some countries such as: Armenia – 8, Azerbaijan – 77, Georgia – 78 (Otto, 2017), Bulgaria – 80 (Blagoev et al., 2017), Greece – 65 (Bosmans and Chatzaki, 2005) and Iran – 65 (Zamani et al., 2017). Recent works on the spider fauna of West Anatolia were published by Kaya and Uğurtaş (2008, 2011) – Araneidae and Theridiidae; Yılmaz et al. (2009) – Thomisidae; Kunt et al. (2009) – Dysderidae; Uyar et al. (2010, 2015) – Philodromidae and Theridiidae; Uyar and Uğurtaş (2012) – Salticidae. Considering the zoogeographical diversification (Kosswig, 1955; Gümuş and Neubert, 2009) and size of Turkey, the faunal studies on the diversity of Turkish spider fauna is not from being completed. Thus, the aim of the study is to contribute to knowledge of Turkish wolf spider fauna.

* *Corresponding author* / Haberleşmeden sorumlu yazar: Tel.: +905557041973; Fax.: +905557041973; E-mail: zeybio@hotmail.com
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1.1 Study Areas

Majority of localities in the Bursa province (Table 1) were situated in the Uludağ Mt. which is the highest mountain in Northwest Anatolia. It is located immediately behind the city of Bursa (40°N, 29°E). The dimension of Uludağ in the northwest to southeast direction is about 40 km long and 15–20 km wide. The highest peak reaches 2543 m. The mountain is naturally bordered by a Nilüfer stream on the west and south, and by the Bursa city and the town of İnegöl on the north and east. Extensive exposures of both acid granite, gneiss and schist and calcareous crystalline limestone has given rise to a wide range of habitats, many in excellent condition, including broadleaved and coniferous forest, subalpine moorland, seasonal moorland pools, extensive alpine cliff communities, glacial lakes, and exposed summit communities. The flora is exceptionally rich. The principal summit ridge of the mountain (above 2200 m) is composed of hard crystalline limestone, whilst at lower altitudes a range of acidic rocks (including gneiss, granites and schist) predominate, with more localised outcrops of serpentine to the South. Overall, the climate can most closely be regarded as Mediterranean in character, although it is considerably modified by humid air originated from the Sea of Marmara that is trapped by the step nature of the site and the considerable height of peak (Kaynak et al., 2005, Güleryüz et al., 2005).

Uludağ has six vegetation belts characterised by the following vegetation:

Lauretum belt (up to 350 m): *Arbutus unedo* L., *A. andrachne* L., *Erica arborea* L., *Laurus nobilis* L., *Olea europea* L., *Quercus coccifera* L., *Phillyrea latifolia* L., *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Pistacia terebinthus* L. subsp. *Palaestina* (Boiss.) Engler, *Cercis siliquastrum* L., subsp. *siliquastrum*, *Calicotome villosa* (Poiret) Link, *Spartium junceum* L., *Cistus creticus* L. and C. *salviifolius* L.

Castanetum belt (350–700 m): *Castanea sativa* L., *Quercus* spp., *Corylus avellana* L. var. *avellana*, *Crataegus monogyna* Jacq. subsp. *monogyna*, *Cornus mas* L. and *Rosa canina* L.

Fagetum belt (700–1500 m): *Fagus orientalis Carpinus betulus* L., *C. sativa* Miller, *Populus tremula* L., *Pinus nigra*, *Quercus* sp. Arn. subsp. *nigra* var. *caramanica* (Loudon) Rehder

Pinetum belt (1000–1200 m): *P. nigra* subsp. *nigra* var. *caramanica*, *F. orientalis* and *C. Betulus*

Abietum belt (1500–2100 m): *Abies nordmanniana* (Stev.) Spach subsp. *bornmuelleriana* (Matff.) Coode & Cullen, *Juniperus communis* L. var. *saxatilis* Pall., *Vaccinium myrtillus* L., *Prunus divaricata* Ledeb. var. *divaricata*, *Sorbus aucuparia* L., *Salix caprea* L.

Alpinetum belt (1900–2543 m): it can be distinguished as subalpine and alpine. This belt is characterized by hard cushion plant communities consisting of *Acatholimon ulucinum* (Willd. ex Schultes) Boiss. ssp. *ulucinum* var. *ulucinum*, *Astragalus ptilodes* Boiss. var. *ptilodes*, *Festuca punctoria* Sm. and *F. cyllenica* Boiss. The most of endemic plants are distributed in these areas (Kaynak et al., 2005, Güleryüz et al., 2005).

Two localities were situated in the Balıkesir province (Table 1). The specimens were collected in the agricultural landscape. The Kaymak area (Loc. 13) is a walnut field surrounded by a *Pinus nigra* forest. The Ova area (Loc. 19) is a field.

2. Materials and methods

The spiders were collected in 2006–2011 by the first author by means of hand collecting, sweeping dry leaves and grass. The study took place at 24 localities (Table 1) in Balıkesir and Bursa (Marmara region) (Figure 1). A total of 139 specimens were collected of which 14 species were recognised. Specimens were preserved in 70% ethanol and inspected under Leica EZ4 and Olympus SZX12 stereomicroscopes. The works of Tongiorgi (1966), Töpfer-Hofmann et al. (2000), Buchar and Thaler (2002), Heimer and Nentwig (1991) and Roberts (1996) were used for species identification. The taxonomy and general distribution of all species follows World Spider Catalog (2017). The material is deposited in the private collection of the first author. Faunistic data of each species are sorted according to collecting date and are provided in the following order: Number of locality (see Table 1) introduced by an acronym "Loc.": collecting date, number and sex of specimens.

Figure 1. The survey areas, Balıkesir and Bursa

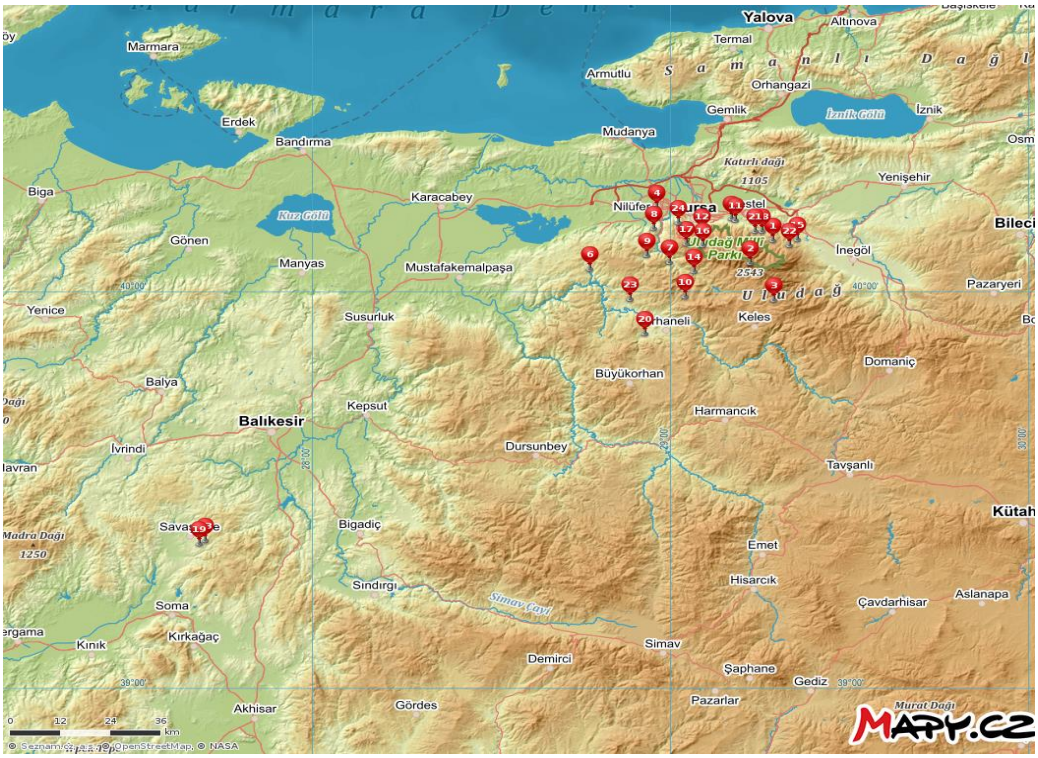

Figure 2. Localities in Bursa and Balıkesir provinces.

Table 1. The list of localities where the spiders have been collected.

NO	LOCALITIES	COORDINATES	ALTITUDE
1	Alaçam, Kestel, Bursa prov.	40°06'55"N, 29°17'17"E	770 m
2	Alpin zone, Uludağ Mountain, Bursa prov.	exact locality unknow	
3	Around the Baraklı Pond, Keles, Bursa prov.	39º58'35"N, 29º17'20"E	1271 m
4	Beşevler, Nilüfer, Bursa prov.	40º12'30"N, 28º57'44"E	138 m
5	Cumalıkızık, Yıldırım, Bursa prov.	40°10'53"N, 29°10'12"E	272 m
6	Near to Çınarcık dam, Orhaneli, Bursa prov.	40°03'18"N, 28°46'28"E	240 m
7	Dağakça village, Osmangazi, Bursa prov.	40º04'20"N, 28º59'53"E	346 m
8	Around the Dağyenice village pond, Bursa prov.	40°09'17"N, 28°57'17"E	366 m
9	Around the Doğanca dam, Nilüfer, Bursa prov.	40º05'20"N, 28º56'06"E	384 m
10	Around the Göynükbelen village, Orhaneli, Bursa prov.	39º59'09"N, 29º02'35"E	900 m
11	Hamamlıkızık, Bursa prov.	40°10'33"N, 29°10'53"E	304 m
12	Kadıyayla, Uludağ Mountain, plateau surrounded by forest, Bursa prov.	40º09'01"N, 29º05'19"E	1233 m
13	Kaymak area, Aşağıdanışment village, Savaştepe, Balıkesir prov.	39º22'17"N, 27º42'01"E	475 m
14	Keles road, 26. km, Bursa prov.	40°02'55"N, 29°03'57"E	556 m
15	Kozluören village, Inegöl, Bursa prov.	40º07'43"N, 29º21'17"E	480 m
16	Kirazlıyayla, Uludağ Mountain, Bursa prov.	40º06'50"N, 29º05'25"E	1522 m
17	About 3 km to National Park, Uludağ Mountain, Bursa prov.	40°07'04"N, 29°02'43"E	1175 m
18	Near to Osmaniye, Kestel, Bursa prov.	40°08'55"N, 29°15'24"E	619 m
19	Ova, Aşağı Danışment, Savaştepe, Balıkesir prov.	39°21'52"N, 27°41'09"E	439 m
20	Sadağı Canyon, Orhaneli, Bursa prov.	39º52'96"N, 28º55'49"E	443 m
21	Saitabat village, Kestel, Bursa prov.	40°08'58"N, 29°14'08"E	653 m
22	Sayfiye village, Inegöl, Bursa prov.	40°06'48"N, 29°19'56"E	874 m
23	After Setat Mining Büyükorhan road, Bursa prov.	39°58'43"N, 28°53'14"E	521 m
24	Around Yiğitali village, Osmangazi, Bursa prov.	40º10'10"N, 29º01'17"E	660 m

3. Results

Genus *Alopecosa* Simon, 1885

***Alopecosa albofasciata* (**Brullé, 1832)
Collected Material: Loc. 10: 07.05.2007, 1 ♂, 05.05.2008, 1 ♂; **Loc. 13**: 17.04.2010, 1 ♀, 30.06.2010, 2 ♀♀, 13.05.2011, 1 ♀; **Loc. 7**: 16.05.2010, 1 ♂, 1 ♀, 11.07.2010, 1 ♀; **Loc. 9**: 16.10.2010, 1 ♂, 01.05.2011, 2 ♀♀, 23.04.2011, 1 ♂; **Loc. 8**: 08.05.2011, 3 ♀♀; **Loc. 23**: 09.05.2011, 2 ♀♀, 2 ♂♂. (Collected under stones and on herbs.)
Distribution: Mediterranean to Central Asia

Alopecosa farinosa (Herman, 1879)
Collected Material: Loc. 16: 23.04.2006, 1 ♂; **Loc. 17**: 23.04.2006, 1 ♀; **Loc. 5**: 11.07.2006, 1 ♀; **Loc. 1**: 02.05.2007, 2 ♂♂, 3.05.2007, 1 ♂, 1 ♀. (Collected on the ground or on herbs.)
Distribution: Palaearctic

Alopecosa pentheri (Nosek, 1905)
Collected Material: Loc. 24: 23.04.2006, 3 ♂♂; **Loc. 1**: 03.05.2007, 3 ♂♂; **Loc. 3**: 07.05.2007, 3 ♀♀. (Collected on the ground near water or under stones.)
Distribution: Albania, Bulgaria, Greece to Azerbaijan

Alopecosa pulverulenta (Clerck, 1757)
Collected Material: Loc. 1: 02.05.2007, 1 ♂, 4 ♀♀; **Loc. 4**: 10.05.2010, 1 ♀.
Distribution: Palaearctic

Genus: *Aulonia* C. L. Koch, 1847

Aulonia albimana (Walckenaer, 1805)
Collected Material: Loc. 22: 16.07.2006, 2 ♀♀; **Loc. 18**: 08.07.2007, 1 ♀.
Distribution: Palaearctic

Gen: *Geolycosa* Montgomery, 1904

Geolycosa vultuosa (C. L. Koch, 1838)
Collected Material: Loc. 9: 01.05.2011, 1 ♀. (Collected among herbs.)
Distribution: Southeastern Europe to Central Asia

Genus: *Hogna* Simon, 1885

Hogna radiata (Latreille, 1817)
Collected Material: Loc. 6: 13.07.2006, 3 ♀♀; **Loc. 14**: 26.07.2006, 2 ♀♀; **Loc. 15**: 20.06.2010, 4 ♂♂; **Loc. 19**: 01.07.2010, 1 ♂; **Loc. 7**: 11.07.2010, 1 ♂. (Collected under stones, on the ground or under dry herbs.)
Distribution: Central Europe to Central Asia, Iran, Central Africa

Genus *Pardosa* C. L. Koch, 1847

Pardosa atomaria (C. L. Koch, 1847)
Collected Material: Loc. 18: 03.06.2006, 1 ♂, 2 ♀♀; **Loc. 20**: 22.02.2007, 1 ♂; **Loc. 10**: 07.05.2007, 1 ♀. (Collected on herbs, near water or on the ground.)
Distribution: Balkans, Crete, Cyprus, Rhodes, Aegean Is.

Pardosa consimilis Nosek, 1905
Collected Material: Loc. 12: 23.07.2006, 2 ♀♀.
Distribution: Macedonia, Bulgaria, Turkey

Pardosa hortensis (Thorell, 1872)
Collected Material: Loc. 24: 23.04.2006, 6 ♀♀; **Loc. 16**: 23.04.2006, 1 ♀; **Loc. 18**: 1 ♀; **Loc. 2**: 08.07.2006, 1 ♀; **Loc. 11**: 11.07.2006, 1 ♀; **Loc. 21**: 02.05.2007, 1 ♀; **Loc. 1**: 02.05.2007, 24 ♀♀, 03.05.2007, 6 ♀♀; **Loc. 3**: 07.05.2007, 6 ♀♀; **Loc. 10**: 07.05.2007, 1 ♂; **Loc. 20**: 22.07.2007, 7 ♀♀, 02.06.2008, 1 ♀; **Loc. 9**: 01.05.2011, 1 ♀. (Collected on the ground, under stones or on herbs.)
Distribution: Palaearctic

Pardosa monticola (Clerck, 1757)
Collected Material: Loc. 2: 08.07.2006, 1 ♂, 2 ♀♀. (Collected on the ground.)
Distribution: Europe

Pardosa pertinax von Helversen, 2000
Collected Material: Loc. 16: 23.04.2006, 2 ♂♂; **Loc. 1**: 02.05.2007, 2 ♂♂; **Loc. 9**: 01.05.2011, 2 ♂♂. (Collected on herbs.)
Distribution: Greece, Turkey

Pardosa proxima (C. L. Koch, 1847)
Collected Material: Loc. 5: 11.07.2006, 1 ♀; **Loc. 11**: 11.07.2006, 1 ♂ (too small); **Loc. 1**: 02.05.2007, 1 ♀; **Loc. 9**: 01.05.2013, 4 ♀♀; **Loc. 8**: 08.05.2011, 1 ♀ (Collected on herbs.)
Distribution: Palaearctic, Canary Is., Azores

Genus: *Trabea* Simon, 1876

Trabea paradoxa Simon, 1876
Collected Material: Loc. 13: 25.07.2011, 1 ♀. (Collected on the ground in *Pinus nigra* forest.)
Distribution: Southern Europe, Turkey

4. Conclusions and discussion

In total, 14 species from six genera have been registered in this study, *Trabea paradoxa* for the first time in Anatolia. The genus *Pardosa* exhibited the largest number of species (five species). *Pardosa hortensis* was the most widespread species in the surveyed area. *Aulonia* is small genus and up to now, only two species [*Aulonia albimana* (Walckenaer, 1805) and *Aulonia kratochvili* Dunin, Buchar and Absolon, 1986)] are known in Turkey.

From a zoogeographic point of view, Turkey acts as a connection between European lowlands and Mediterranean basin on the one hand, and two Asian mountain ranges: the Caucasus and the Iranian Plateau on the other hand. Thus, spiders occurring in Turkey may have affinities to all these zoogeographical regions. However, the species recorded in this study have affinities mainly to Europe. Almost all wolf spider species (except *A. pentheri*, *P. consimilis* and *P. pertinax*) recorded in this study are the lowland species reaching to various parts of Europe (Buchar, 2009). *Alopecosa albofasciata*, *A. pentheri*, *G. vultuosa*, *H. radiata*, *P. atomaria*, *P. hortensis*, *P. proxima* and *T. paradoxa* are typical representatives of Mediterranean species. Of these, only *P. hortensis* reach up to central Europe and even to the British Islands (Buchar 1993). *Alopecosa farinosa*, *A. pulverulenta* and *A. albimana* are the extra-Mediterranean species; *P. monticola* is a temperate species, *P. pertinax* is a boreo-montane species (Buchar, 2009) and *A. pentheri* inhabit mountain ranges (Thaler et al., 2000; Buchar and Dolanský 2011). All of them, with the exception of *P. pertinax* and *A. pentheri*, are widespread in Europe (Buchar, 1993). On the other hand, *P. consimilis* was reported only from three countries (Macedonia, Bulgaria, Turkey).

To sum up, mostly widespread species were documented in this study. The most important records were those of *A. pentheri*, *P. consimilis*, *P. pertinax* and *T. paradoxa* because they are rare or less frequently found species. To date, the family Lycosidae contains 87 species in 15 genera in Turkey. In this study, *A. farinosa*, *A. albimana*, *P. consimilis*, *P. hortensis* and *P. monticola* are the first records for the Marmara region in Turkey.

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