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The herpetofauna of Madran Mountain (Aydın, Turkey)

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Abstract: This study investigates amphibian and reptile species of Madran Mountain. Specimens were collected in September 2011 and April and May 2012. A total of 23 species (3 amphibians and 20 reptiles) were determined. These species are thought to contribute to our knowledge of the Turkish herpetofauna. In addition, a chorotype classification of the species determined on Madran Mountain is given.

Key words: Madran Mountain, herpetofauna, amphibians, reptiles, Aydın

Turkey has very high biodiversity, encompassing a wide range of different groups, due to its various topographical, geological, and climatic features. In particular, certain mountain chains play important roles as barriers in zoogeographical ranges. These barriers not only promoted the diversification of organisms but also led to important differences between continents in terms of biological composition. Especially during glacial and postglacial periods, these barriers prevented major transitions and caused remarkable population differentiations and/or limited distributions of the populations (Kosswig, 1955; Demirsoy, 1999). The different geographical conditions in Turkey also created a wide variety of ecological environments that promoted species diversity. This explains the country's high diversity of amphibians and reptiles.

In recent years, studies examining amphibian and reptile diversity on a region-by-region basis have increased in Turkey (Çevik, 1982; Baran, 1983, 1984, 1990; Uğurtaş, 1989; Baran et al., 1997, 2001, 2004; Doğaç, 1998; Kumlutaş et al., 1998, 2000, 2001, 2004; Uğurtaş et al., 2000; Özdemir and Baran, 2002; Hür et al., 2008; Afsar et al., 2011). Beyond detailed information on species distributions, this has helped clarify the systematic position of the respective species.

Madran Mountain, our research area, is one of the highest mountains in the Aegean region (1792 m a.s.l.). It is located between 3 towns in Aydın Province: Çine to the southwest, Bozdoğan to the east, and Yenipazar to the north (Figure 1). The villages of Alabayır and Topçam lie south of the mountain. This mountain is characterized by a typical Mediterranean climate with dry summers and mild

and rainy winters. The major rivers of the mountain are the Çine in the south and the Akçay in the east, accompanied by many small and large streams. Çine Dam is located to the south, and Lake Kavşit is located northwest of Madran.

Although previous studies have dealt with amphibians and reptiles from Aydın (Baran, 1976; Başoğlu and Baran, 1977), no detailed study has yet been conducted on the amphibian and reptile species of Madran Mountain. Here, we provide a record of the herpetofauna of Madran Mountain (Aydın) and contribute to the literature on the Turkish herpetofauna.

Fieldworks were conducted in September 2011 and April and May 2012. Species were collected using different techniques according to habitat conditions. The specimens were fixed using traditional methodologies (Başoğlu and Baran, 1977, 1980; Özeti and Yılmaz, 1996), but formaldehyde solution was not used so that further molecular studies could be performed. The animals were treated in accordance with the guidelines of the local ethics committee (B.30.2.ADÜ.0.00.00.00/050.04/2011/033). They were deposited in the collection of the Zoology Section of the Department of Biology at Adnan Menderes University. The systematics of the examined materials were studied using current literature (Başoğlu and Özeti, 1973; Başoğlu and Baran, 1977, 1980; Baran and Atatür, 1998; Venchi and Sindaco, 2006; Baran et al., 2012).

The study area was divided into 7 stations. Station 1: Hışımlar and Altıntaş villages, Bozdoğan; Station 2: Madran, Ziyaretli, Pınarlı, and Osmaniye villages, Bozdoğan; Station 3: Karaçakal and Koyunlar villages, Yenipazar; Güneyköy village, Bozdoğan; Station 4: Kavşit village, Çine; Station 5: Yeniköy village, Çine; Station 6:

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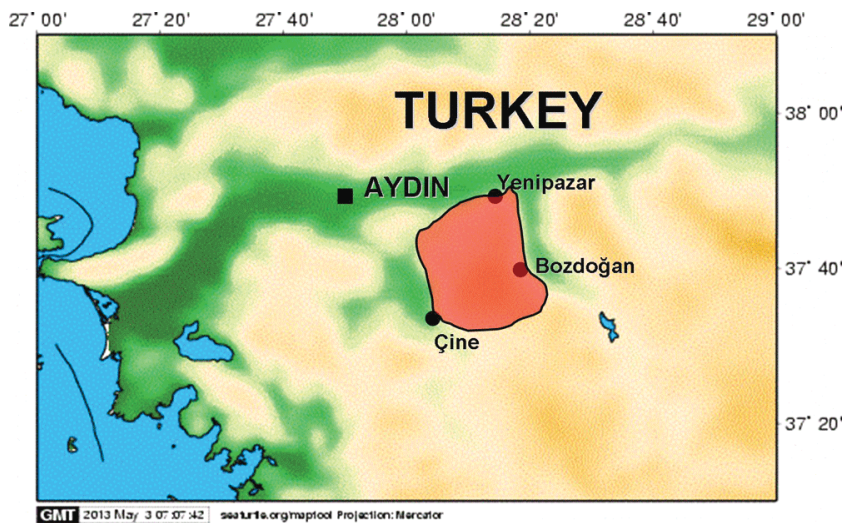


Figure 1. The research area in which specimens were collected.

Kırksakallar, Alabayır, and Topçam villages, Çine; Station 7: summit of Mount Madran.

All species were identified by comparing key morphological characteristics, such as the number of scales and plates, color and pattern characteristics, and body measurements and ratios, with previous herpetofaunistic studies (e.g., Schmidtler, 1975; Baran, 1976, 1977a, 1977b, 1982; Başoğlu and Baran, 1980; Baran and Gruber, 1982; Baran and Öz, 1985; Yılmaz and Uğurtaş, 1990; Tok, 1993, 1999a, 1999b, 1999c; Göçmen et al., 1996, 2003; Baran and Atatür, 1998; Tosunoğlu, 1999; Türkozan et al., 2003; Kumlutaş et al., 2004; Afşar, 2006; Cihan, 2007; Ayaz et al., 2008; Güçlü and Olgun, 2008; Eser, 2009; Afsar et al., 2011). The material list is given in Table 1.

The detailed excursions to the research area yielded 13 families, 23 genera, and 23 species. Of these, 3 species are anurans, 1 is a tortoise, 1 is a turtle, 9 are lizards, and 9 are snakes. The lizard population here had the highest abundance ($N = 104$), followed by snakes ($N = 34$), anurans ($N = 17$), tortoises ($N = 8$), and turtles ($N = 1$). The distribution of the species according to the stations is given in Figure 2. Station 2 and Station 4 have higher species diversities compared to the other stations: 2 amphibian, 1 turtle, 9 lizard, and 7 snake species were determined at Station 2, and 3 amphibian, 2 turtle, 8 lizard, and 6 snake species were determined at Station 4 (Figure 2)

Based on their distributions, the species recorded on Madran Mountain were arranged into 8 chorotypes according to the checklist of Sindaco et al. (2000) (Table 2). Due to the geographical position of the mountain, 31% of the species belong to the Eastern Mediterranean and 26% to the Turano-Mediterranean chorotypes. The SW-Asiatic (13%), Turano-Europeo-Mediterranean (9%), and Mediterranean (9%) are represented by 3, 2, and 2 species,

respectively. The SW-Anatolian Endemic, European, and Central Asiatic-Europeo-Mediterranean chorotypes are represented by only 1 species (4%) each (Figure 3).

The most common amphibians on the mountain are *Pseudepidalea variabilis* (Pallas, 1769) and *Pelophylax bedriagae* (Camerano, 1882). The most common reptiles are *Ophisops elegans* Ménétries, 1832; *Anatololacerta oertzeni* (Werner, 1904); *Ablepharus kitaibellii* (Bibron & Bory Saint-Vincent, 1833); *Blanus strauchi* (Bedriaga, 1884); *Hemidactylus turcicus* (Linnaeus, 1758); and *Typhlops vermicularis* (Merrem, 1820). The species reported for this area but not observed in the present study are *Hyla orientalis*, *Emys orbicularis* (Linnaeus, 1758), *Pseudopus apodus* (Pallas, 1775), *Chamaeleo chamaeleon* (Linnaeus, 1758), *Dolichophis caspius* (Gmelin, 1789), *Malpolon insignitus* (Geoffroy de Saint-Hilaire, 1809), *Natrix tessellata* (Laurenti, 1768), and *Zamenis situla* (Linnaeus, 1758) (Başoğlu and Baran, 1977; Baran and Atatür, 1998; Başoğlu and Baran, 1998; Baran et al., 2012).

Anatolia is a predominantly mountainous area whose diverse geomorphology produces many different climatic regions and vegetation types. These characteristics and the geomorphology of Anatolia were described by Sindaco et al. (2000) in a checklist study of the Anatolian herpetofauna. Based on its position and geology, Anatolia acted in the past as a bridge or as a barrier for species' dispersal between Asia, Europe, and the Ethiopian region via the Middle East, providing a natural pathway or acting as a vicariant agent (Tchernov, 1992). It also played an important role as a refugium during the Quaternary ice ages, holding populations during glacial periods that could move out during the interglacial to Europe via Thrace and the Caucasus (Hewitt, 2001; Kornilious et al., 2011). Accordingly, mountains provide important refuges for fauna (Kosswig, 1955; Demirsoy 1999).

Table 1. List of amphibian and reptile species (N: number of specimens, juv: juvenile).

Family	Species	N	Station
Bufonidae	<i>Bufo bufo</i>	2 + 1 juv	1, 4
	<i>Pseudepidalea variabilis</i>	8	2, 4, 6
Ranidae	<i>Pelophylax bedriagae</i>	6	2, 4, 6
Geoemydidae	<i>Mauremys rivulata</i>	1	4
Testudinidae	<i>Testudo graeca</i>	8	2, 3, 4, 6
Agamidae	<i>Laudakia stellio</i>	5 + 3 juv	2, 3, 4
Amphisbaenidae	<i>Blanus strauchi</i>	13	2, 4, 6
Gekkonidae	<i>Mediodactylus kotschy</i>	5	2, 6
	<i>Hemidactylus turcicus</i>	10	2
Lacertidae	<i>Anatololacerta oertzeni</i>	19	2, 3, 4, 6
	<i>Lacerta trilineata</i>	5 + 4 juv	2, 3, 4, 6
	<i>Ophisops elegans</i>	21	2, 3, 4, 5, 6
Scincidae	<i>Ablepharus kitaibelii</i>	13	1, 2, 6, 7
	<i>Trachylepis aurata</i>	6	2, 4, 6
Boidae	<i>Eryx jaculus</i>	3	2,3
Colubridae	<i>Dolichophis jugularis</i>	4	2, 3, 4, 6
	<i>Eirenis modestus</i>	7	2, 5, 6
	<i>Hemorrhois nummifer</i>	1	2
	<i>Natrix natrix</i>	8	3, 4, 6
	<i>Platyceps najadum</i>	1	4
	<i>Telescopus fallax</i>	4	3, 4
	Typhlopidae	<i>Typhlops vermicularis</i>	10
Viperidae	<i>Montivipera xanthina</i>	3	2, 3, 5

During the fieldwork, it was determined that Madran Mountain hosted a variety of plant and animal species. Due to the range of microclimatic variations related to the uplift of the mountain, many different biotopes were

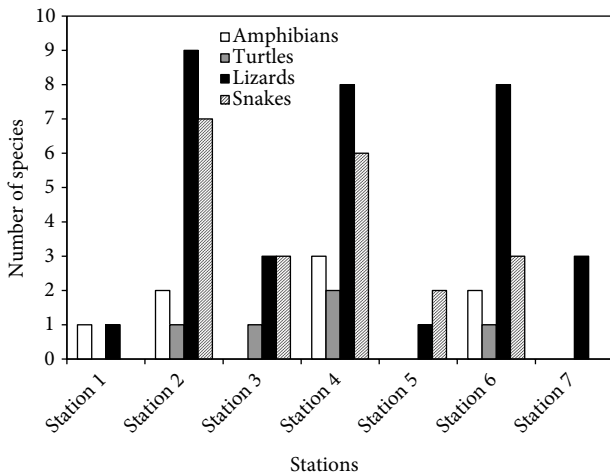


Figure 2. Species distribution according to stations.

detected. Nonetheless, several factors threatening natural wildlife were also observed. The first is the conversion of natural habitats into agricultural land. This no doubt impacts plant and animal species living on this mountain. The second is the removal of natural vegetation and replacement with fruit trees. This involves both an increase in the use of pesticides and the destruction of the natural flora. During the studies, we also observed fishes being introduced into many small ponds on the mountain. This creates new competition between species, ultimately affecting amphibians and reptiles. Finally, the activity of livestock, especially goats, is another factor damaging the environment on the mountain.

This study underlines the importance of Madran Mountain as a herpetological area, but anthropogenic impacts are increasing. We therefore suggest better protection of the mountain, accompanied by more detailed flora and fauna studies, which would provide more comprehensive data about its biological and ecological characteristics and better insights into management strategies.

Table 2. Chorotype classification of amphibians and reptiles on Madran Mountain.

Chorotype	Amphibia	Reptilia	Species
European	1		<i>Bufo bufo</i>
Turano-European-Mediterranean	2		<i>Pseudepidalea variabilis</i> <i>Pelophylax bedriagae</i>
Turano-Mediterranean		6	<i>Mauremys rivulata</i> <i>Testudo graeca</i> <i>Hemorrhois nummifer</i> <i>Platyceps najadum</i> <i>Telescopus fallax</i> <i>Typhlops vermicularis</i>
SW-Anatolian Endemic		1	<i>Anatololacerta oertzeni</i>
Mediterranean		2	<i>Hemidactylus turcicus</i> <i>Eryx jaculus</i>
E-Mediterranean		7	<i>Lacerta trilineata</i> <i>Ophisops elegans</i> <i>Ablepharus kitaibelii</i> <i>Montivipera xanthina</i>
SW-Asiatic		3	<i>Trachylepis aurata</i> <i>Dolichophis jugularis</i> <i>Eirenis modestus</i>
Central Asiatic-European-Mediterranean		1	<i>Natrix natrix</i>
Total	3	20	

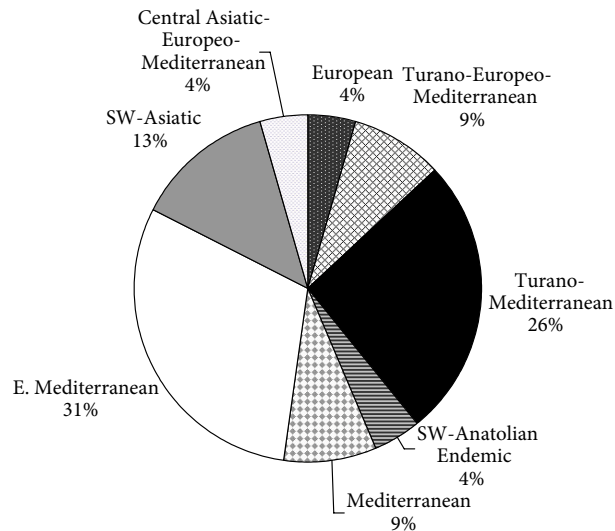


Figure 3. Percentages of the main chorotypes of Madran Mountain.

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