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Herpetofauna of the Province of Kütahya, Turkey

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Abstract

This study investigated the amphibian and reptilian fauna of Kütahya Province, Turkey. A total of 25 amphibian and reptile species were identified, consisting of six anurans, one turtles, one tortoise, nine lizards, and eight snakes. A zoogeographical assessment was also carried out in which the chorotypes and the IUCN criteria of the species were added..

Keywords: Kütahya, Herpetofauna, Amphibia, Reptilia, Chorotype, Biodivesity

INTRODUCTION

Historical Background

Turkey has very high biodiversity, encompassing a wide range of different groups, due to its various topographical, geological, and climaticfeatures. 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 [1] . The different geographical conditions in Turkey also created a wide variety of ecological environments that promoted speciesdiversity. This explains the country's high diversity of amphibians and reptiles. In the surveys compiled with studies of the amphibians and reptiles in Turkey up to recent times [2,3]. It was found that researchers had mostly either investigated species one by one or else compared samples from different regions. However, there has been an increase in the number of studies detailing all herpetofauna in a specific region. In general, collecting specimens from different localities in specific regions is more complicated. Thus, it is more important to determine and describe the entire amphibian and reptilian species of a specific region [4,5,6,7,8,9,10,11,12 ,13,14]. In this way, detailed information was obtained about the distribution of species besides the clarification of their systematic positions. For such reasons, detailed studies on the herpetofauna of a specific region have gained importance. Today some regions are being taken under conservation so as to conserve the natural wealth.

The Turkish Province of Kütahya, part of the Aegean Region, covers an area of 2.484 km². Kütahya study area is located in the plains shaped groove extending roughly east-west direction, it is located at an altitude of approximately 950 meters above sea level. Although the Mediterranean climate area of Kütahya, varies in terms of temperature and precipitation. As for the whole Province of Kütahya, the lowest mean temperature (-19.5 °C) is observed in January, the highest (29.6 °C) in July; annual mean temperature is 13.7 °C, and the average rate of humidity is 75.6 % (Turkish state meteorological service 2016). Even though, there is only one study involving the herpetefauna of the murat mountain, (Kütahya-Uşak), the distributions of the species is insufficiently known. This study compiles distribution information and reports environmental factors that threaten the herpetofaunal species.

MATERIALS and METHODS

A total of 172 specimens of 25 species were collected from 21 stations during expeditions carried out in 2015 and 2017. Species were captured using different methods. Aquatic species were caught by hand or with a scoop, and terrestrial species by hand or by use of a net. The amphibian and reptilian specimens were measured using traditional methodologies [15,16,17] and counted as required in places where they were seen and then released into nature. The localities where the specimens were captured and seen in the province of Kütahya are shown in the Figure.1. The status of species determined according to some international agreements in which Turkey is included are demonstrated in Table 1

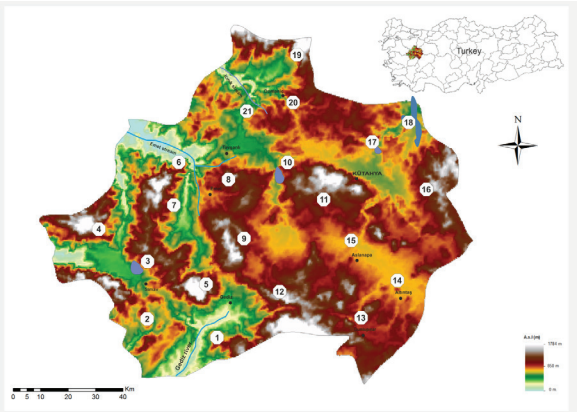

Figure 1. The localities where the specimens were captured and seen in province of Kütahya (1-Gediz river, 2-Simav mountain, 3-Simav Lake, 4-Ak-mountain, 5-Saphane mountain, 6-Emet stream, 7-Kirazlı-hill, 8-Buzluca mountain, 9-Koca-mountain, 10-Çavdarhisar pond, 11-Yellice mountain, 12-Murat mountain, 13-Dumlupınar, 14- Altıntaş, 15-Koca-moutain (Aslanapa), 16-Türkmen mountain, 17- Kayaboğazı pond 18- Porsuk pond, 19 Ulu-mountain, 20-Domaniç, 21- Kınıkstream)

RESULTS

The study revealed the presence 25 amphibian and reptilian species in the region, comprising six amphibian

(6 anuran) and 19 reptilian taxa (2 turtles, 9 lizards and 8 snakes). Of the 25 species detected in the study area, Testudo graeca Linnaeus, 1758 is in the 'Vulnerable (V)' category and Pelophylax ridibunda Pallas, 1771, Emys orbicularis (Linnaeus, 1758) is in the 'Near Threatened (NT)' category according to the IUCN criteria, whereas the others are in the 'Least Concern (LC)' category. On the other hand, when evaluated according to the BERN criteria, all the species were taken under protection. Of them, 11 species were strictly protected (according to Appendix II) and 19 were included in the European Union Directive on Habitats and Species (in Appendix IV).

In the study area, the amphibian specimens (Figure 2) were encountered in sparsely vegetated regions or forestland, moist stony sections, vineyards, gardens, areas covered with small arboreal plants, pastures with a wet ground, places nearby water, and habitats with abundantly vegetated pools, lakes, and slowly flowing waters. Of toads, Bufotes variabilis (Laurenti, 1768) and Bufo bufo (Linnaeus, 1758) were encountered in places with dense plants of steppe and xerophytic areas, whereas the specimens belonging to the other amphibian species were encountered in regions with dense aquatic and moisture loving plants. Pelobates syriacus Boettger, 1889 is not easy to find this toad since it hides in the mud, presumably digging down into the humid subsoil for most of the year. They are adapted to this behavior by possessing a special tubercle on their hind feet that helps them burrow backwards and hide rapidly in the mud. Adults were seen after the first heavy rains of the winter season (January-February 2016) in the province of Kütahya. Until our study, there were no records of this species in the examined area. Therefore, this is the first information of P. syriacus presence in the province of Kütahya. On the other hand, reptile specimens (Figure 2) were encountered in all habitats under investigation. The specimens of species Emys orbicularis (Linnaeus, 1758), Natrix natrix (Linnaeus, 1758), and Natrix tessellata (Laurenti, 1768) were encountered in moist habitats where aquatic and moisture-loving plants were also available, while all the other reptile specimens were encountered in the habitats with plants of xerophytic areas.

Table 1. The localities where the specimens were captured from the province of Kütahya, the Bern values, the IUCN criteria, and the European Union Habitat values. The international agreements provided in the table and their abbreviations are as follows: the IUCN (International Union for the Conservation of Nature and Natural Resources) criteria (VU: Vulnerable; NT: Near Threatened; and LC: Least Concern), whether they are included in the European Union Directive on Habitats and Species (in this directive, the species included in Appendix IV are marked with '1' , whereas those not included in it are marked with '0'), and the criteria of the Bern Convention (Appendix II: Strictly Protected Fauna Species; Appendix III: Protected Fauna Species).

Species	Number of specimens and their sex	Localities	IUCN	Bern value	EU Habitat value
AMPHIBIA					
Bufo bufo	3 (2♂♂, 1♀)	6- 12-16	LC	Appendix III	0
Bufotes variabilis	14 (8♂♂, 6♀♀)	1-3-6-8-10-13-16-19-20-21	DD	Appendix III	1
Hyla orientalis	6 (5♂♂, 1♀)	1-3-6-21	LC	Appendix II	1
Pelobates syriacus	1 (1♂)	1	LC	Appendix II	1
Pelophylax ridibunda	45(30♂♂, 8♀♀, 7 juv)	1-2-3-4-6-7- 10-11- 12- 16-17-18-19-20	NT	Appendix III	0
Rana macrocnemis	6 (6♂♂)	4-6-9-16-19-20	LC	Appendix III	0
REPTILIA					
Emys orbicularis	4(1♂, 3♀♀)	3-10-18-20	NT	Appendix II	1
Testudo graeca	9(7♂♂, 2♀♀)	1-2-11-13- 15- 16-19-20-21	VU	Appendix II	1
Ablepharus kitaibellii	4(2♂♂, 2♀♀)	6-13-14	LC	Appendix II	1
Lacerta trilineata	18(4♂♂, 6♀♀, 8 subadult)	1-3-7-11- 16-20-21-22	LC	Appendix II	1
Ophisops elegans	13(9♂♂, 6♀♀)	1-2-3-6-8-10-13-16-19-20-21	LC	Appendix II	1
Parvilacerta parva	4(3♂♂, 1♀)	14-18-20	LC	Appendix II	1
Podarcis muralis	2(2♂♂)	6	LC	Appendix II	1
Pseudopus apodus	3(2♂♂, 1♀)	2-6-12	LC	Appendix III	1
Stellagama stellio	5 (3♂♂, 2♀♀)	4-12-13-16	LC	Appendix III	1
Anatololacerta anatolica	7(5♂♂, 2♀♀)	12-10-14-16	LC	Appendix II	1
Trachylepis aurata	4(3♂♂, 1♀)	6-11-14	LC	Appendix III	0
Dolichophis caspius	3 (1♂, 1♀,1 subadult)	1-13-14	LC	Appendix III	1
Eirenis modestus	3 (1♂, 2♀♀)	12-15-16	LC	Appendix III	1
Hemorrhois nummifer	1 (1♂)	13	LC	Appendix III	1
Montivipera xanthina	2 (1♂, 1 subadult)	12-20	LC	Appendix III	1
Natrix natrix	7(6♂♂, 1♀)	3- 6-10-16-18-19	LC	Appendix III	0
Natrix tessellata	4(2♂♂, 1♀, 1 subadult)	3-10- 17-18-19	LC	Appendix II	1
Typhlops vermicularis	2(2♂♂)	12-21	LC	Appendix III	0
Zamenis situla	2 (2♂♂)	16-21	LC	Appendix II	1
Total	172 (109♂♂ 45♀♀, 11 subadult, 7 juv)				

Figure 2. General views of specimens of ampbian and some reptilian from province.

The species detected in the province of Kütahya can be grouped into 10 chorotype categories [18,19], [20] (Table 2). Accordingly, the Central Asiatic-European (4%), Central Asiatic-E-Mediterranean (28%), category is represented by 7 species; Turano-Mediterranean (20%) is represented by 5 species; SW-Asiatic (12%) category is represented by 3 species; Euro-Siberian, SW-Anatolian endemic and Turano-European-Mediterranean are represented by 2 species and the Turano-European (4%), European (4%), Central Asiatic-European (4%), Central Asiatic-Europeo Mediterranean (4%), are represented by only 1 species each (Table 2, Figure 3).

Table 2. The chorotype classification of the amphibian and reptile species in the province of Kütahya

Chorotypes	Amphibian	Reptilian	Species
Central Asiatic-European		1	Natrix tessellata
Central Asiatic-Europeo Mediterranean		1	Natrix natrix
European	1		Bufo bufo
Euro-Siberian	1	1	Pelophylax ridibunda, Podarcis muralis
SW-Anatolian endemic		2	Anatololacerta anatolica, Parvilacerta parva
SW-Asiatic	1	2	Eirenis modestus, Rana macrocnemis, Trachylepis aurata
Turano-European	1		Pelobates syriacus
Turano-European-Mediterranean	1	1	Emys orbicularis, Bufotes variabilis
Turano-Mediterranean		5	Dolichophis caspius, Hemorrhois nummifer, Pseudopus apodus, Testudo graeca, Typhlops vermicularis
E-Mediterranean	1	6	Stellagama stellio, Ablepharus kitaibellii, Hyla orientalis, Lacerta trilineata, Ophisops elegans,Montivipera xanthina, Zamenis situla
Total	6	19	

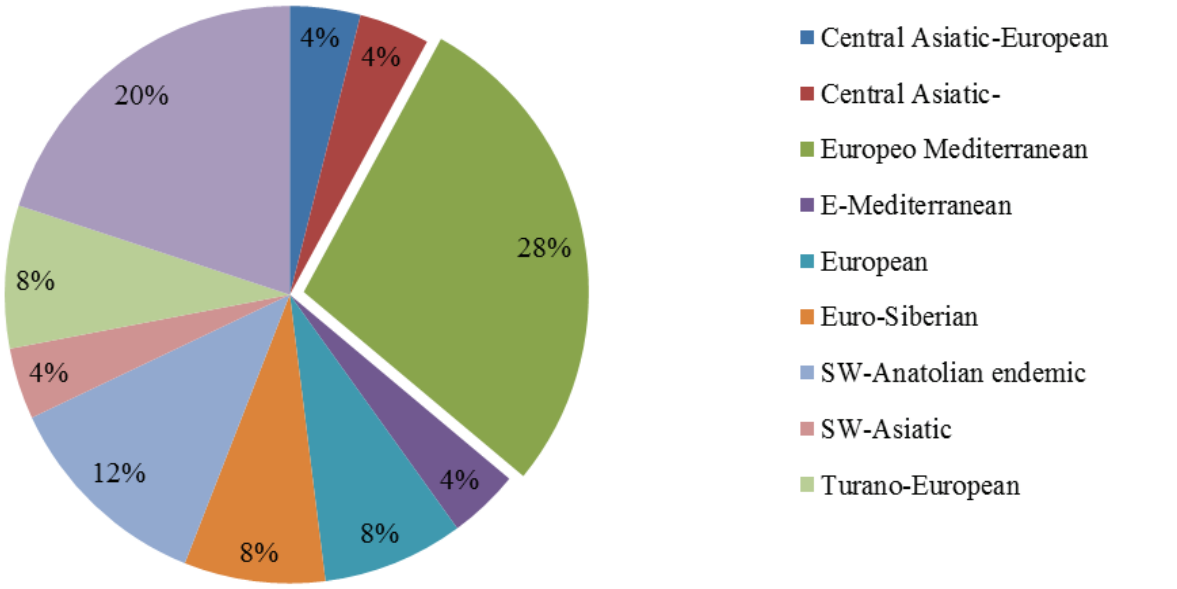

Figure 3. Percentage distribution of major chorotypes of amphibian and reptilian species

DISCUSSION

In this research, 25 species of 14 amphibian and reptile families were detected in the province of Kütahya. Of these species, 6 are anurans, 1 is a tortoise, 1 is a turtle, 9 are lizards, and 8 are snakes. The anurans population here had the highest abundance (N = 75, 43.60%), followed by reptil (N = 60, 34.88%), snakes (N = 24, 13.95 %), turtles (N = 4, 2.32%), and tortoises (N = 9, 5.22%). Six amphibia species were found in this study area. Among them, B. bufo (Linnaeus, 1758), B. variabilis (Laurenti, 1768 and Pelophylax ridibunda Pallas, 1771 show very wide distribution throughout Turkey. The other species, Rana. Macrocnemis Boulenger 1885,, is a mountain frog that lives at 1000 m altitude. As mentioned before, it was found that R. macrocnemis Boulenger 1885 is distributed on Murat Mountain [11]. However, as a result of this study it was determined that this species is also distributed on the different localities (4-6-9-16-19-20, Figure 1) in the province of Kütahya. In this research, it was determined for the first time that Hemorrhois nummifer (Reuss, 1834), Podarcis muralis (Laurenti, 1768) lives in the north-east part of the Murat Mountains, which is situated in location-6 and that Pelobates syriacus Boettger, 1889 known to be distributed in southern Anatolia is found around the Gediz river in location 1 of the province of Kütahya.

In the province of Kütahya, the greatest diversity of species was detected in the locality of Türkmen Mountain and Ulu-mountain . This may be accounted for by factors such as the diversity of natural habitats around this locality and the availability of active brooks and water resources flowing into Porsuk pond in both summer and winter. The factors that threaten the amphibian and reptilian species in of the province of Kütahya include concretion, aridity, reduction in the available water resources, destruction of the habitats belonging to these living things, environmental pollution, the agricultural pesticides used in agricultural land, and, most important of all, the negative behavior of local people towards these animals and indifference. Therefore, local authorities must ensure that the local people be informed of the conservation of the biological assets that they possess. Moreover road-kills are the greatest source of direct human-induced wildlife mortality, especially in amphibians. Roads could act as the most important source of mortality when main roads act as strong barriers hampering the migration movements of some species (B.variabilis, Pseudopus apodus, Dolichophis caspius) in province of Kütahya.

CONCLUSION

Herpetofauna studies covering a specific region have gained importance in studies on revealing the Turkish herpetofauna. Moreover, some regions are taken under conservation so as to protect their natural wealth. To date, no study on the herpetofauna of of the province of Kütahya an important wetland was encountered in the literature. The herpetological information obtained in the present study will constitute basic data for possible future studies to protect the species.

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