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Species Diversity and Distribution of Amphibians and Reptiles in Nature Park "Sinite Kamani" in Stara Planina Mt. (Bulgaria)

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Abstract. The current study presents briefly the species composition and distribution of the amphibians and reptiles in the Nature Park "Sinite Kamani" in Stara Planina Mnt. Bulgaria, based on a 2×2 km UTM grid. Between 2012 and 2014, we identified total 20 species (7 amphibians and 13 reptiles). We documented three new amphibian species for the region (*Hyla arborea, Rana dalmatina and Rana graeca, which is discovered for the area for the first time) and three species of reptiles (<i>Testudo hermanni, Ablepharus kitaibelii and Lacerta trilienata*). The contemporary conservation status for each species is presented and conservation threats and problems, specific for the park are discussed.

Key words: herpetofauna, "Sinite Kamani", Nature Park, UTM, NATURA2000, Bulgaria.

Introduction

Nature Park "Sinite kamani" is situated on the south slope of Slivenska Mountain, which is a part of Eastern Balkan Mountain. It occupies 127.3 km² and its borders reach the Balkan ridge to the north, Asenovska River and Asenovets Dam to the west, Bozhurska River to the east and the urbanized area of Sliven with contiguous arable lands to the south. The relief is predominantly low-mountain and only highest parts lie in the middle mountain belt. The altitude varies from 290 m in the south part to 1181 m around Bulgarka Peak, which is the highest in Eastern Balkan Mountain (KUMPULA et al., 2006). The whole territory of the park is also included in NATURA 2000 – site code "BG0000164", site name "Sinite Kamani" (EEA, 2012).

An imperative for adequate management of protected areas is detailed and upto-date knowledge of the area's biodiversity. Studies on species diversity, distribution, and ecology of the herpetofauna in protected areas are amongst the priorities at the European community level (POPGEORGIEV *et al.*, 2010).

The herpetofauna of Nature Park "Sinite kamani" is extremely poorly studied and the available data on the occurrence and distribution of the amphibians and reptiles in the park are rather selective in nature and scares. Until now based on the published literary data there are 4 species of amphibians in the park and 10 reptile species (see Appendices 1 & 2).

The aim of the current study is to present the contemporary species composition of the amphibians and reptiles in NP "Sinite kamani", to map their distribution on a 2×2 km UTM grid and to present their conservation status and discus the specific conservation threats and problems for the herpetofauna in the park.

Material and Methods

Study area. The park is situated in the area with transitional continental climate, while only the highest part is with typical mountain climate. Mean annual temperature in Sliven is 12.4°C, during the coldest month (January) is 1.2°C while the hottest (July) is 23.2°C. At the top of the mountain around "Sinite kamani" resort mean annual temperature is 7.7°C, the hottest month has 17.4°C and the coldest -2°C. Annual amount of precipitation rises from 587 mm in Sliven to 830 at the top of the mountain. The soils in the lower part of the park are luvisols while in the upper they are replaced by cabmisols. There are a lot of places, predominantly with luvisols, where the soils are eroded. The vegetation in the lower part is represented by oak forests, which were strongly influenced by human activity in the past and partially replaced by shrubs of Carpinus orientalis, Quercus pubescens and Fraxinus ornis. Upward the mountain is the area of hornbeam-oak belt communities -Carpinus forest of betulus, Quercus dalechampii and Fagus silvatica (KUMPULA et al., 2006).

Field studies. The field studies were conducted in June-October 2012; April-September 2013 and April-June 2014. Amphibians and reptiles were determined visually using the field guides of ARNOLD & OVENDEN (2002) and BISERKOV et al. (2007). For each recorded species are given valid common and Latin name following SPEYBROECK et al. (2010). Some individuals are identified by their sounds, their eggs or larvae and skin sheds. Route method was used in accordance with the methodology of the Executive Environment Agency and water. The route of the route was

established selectively in the most appropriate locations with suitable habitats for amphibians and reptiles. Each locality was masked using GPS device "Garmin" (manufacturer specified accuracy ± 5 m).

Mapping. For the purposes of mapping we used a standard 10×10 km UTM grid, which was divided into a 2×2 km grid for more detailed representation (Fig. 1). The territory of the study site encompasses 53 2×2 km squares, 13 complete and 40 partial.

Results and Discussion

We recorded 20 species of amphibians and reptiles, or 43% of recognized species in Bulgaria (Table 1). Their UTM distribution is presented in Appendices 3 and 4. We detected the presence of seven amphibian species, one from order Caudata and six from order Anura, corresponding to 4% and 24% (28% totally) of the total Bulgarian respectively batrachofaunal diversity, (TZANKOV & POPGEORGIEV, 2014). Reptiles were represented by 13 species - two from order Testudines, six from suborder Sauria, and five from suborder Serpentes, respectively 5,4%, 16,22%, and 13,51% (35,13% totally) of the total herpetofaunal diversity of Bulgaria (SPEYBROECK et al., 2010). For comparison another in NATURA2000 site - SPA "Besaparski ridove" with similar total area POPGEORGIEV et al. (2010), reported 24 species (9 amphibians and 15 reptiles).

We managed to record all of the previously reported species for which we found published locality data for NP "Sinite kamani". There are few more species previously recorded in the territory of the park by Spiridonov (1986) and Daskalova (2001), but they were never officially published. During this study we documented three new amphibian species (Hyla arborea, Rana dalmatina and Rana graeca) and three new reptilian species (Testudo hermanni, Ablepharus kitaibelii and Lacerta trilienata).

The Greek Stream Frog (*Rana graeca*) is discovered in the area for the first time and this is the species' most northeastern locality ever recorded in Bulgaria. The locality is situated at N42° 44.736' E26° 26.655' (818 m a.s.l.) from an ecotone area of woody- m south from Ichera Village, 24.5.2014 shrub/grass vegetation, approximately 900 (Appendix 5-C).



Fig. 1. Map of NP "Sinite kamani" with 2×2 km UTM grid.

Bufo bufo, B. viridis and *Rana graeca* were recorded with only one specimen from a single square each. The most common species was *Pelophylax ridibundus,* which is one the most common amphibians in the area and in Bulgaria (BISERKOV *et al.,* 2007). The other commonly met species was *Salamandra, salamandra,* registered mainly in the ridge area (Appendix 5-A). The lowest locality is 390 meters a.s.l. (at Asenevets Dam) and the highest - 953 m a.s.l. (near the cave Futula).

From the reptiles the most common reptile species in the Nature Park is the Green Lizard (*Lacerta viridis*) (Appendix 6-D) and the Snake-eyed Skink (*Ablepharus kitaibelii*). The two tortoise species (*Testudo graeca* and *T. hermanni*) are registered mainly in the south parts of the park, where suitable habitats of deciduous forests with shrubs are still available with almost equal number of localities. From the snakes the

Caspian Whip Snake (*Dolichopis caspius*) was recorded near the area "Selishteto"; the Smooth Snake was recorded in the "Karandilla" area and the Grass Snake (*Natrix natrix*) and Nose-horned Viper (*Vipera ammodytes*) were recorded from three localities each, mainly from the south part of the park.

Conservation problems and threats

All registered species (except *Rana dalmatina* and *Natrix natrix*) are protected by the Bulgarian legislation and all recorded species have international conservation status (Table 1). High vulnerability and with the highest conservation status are the two species of tortises.

The dependence of the amphibians on the availability of water in the area for breeding makes them particularly vulnerable to this factor. Of great importance for the maintenance of the popu-

Species	L	Ν	Conservation status					
			BPA	RDB	92/43	BERN	IUCN	CITES
Salamandra salamandra (L., 1758)	4	4	III	-	-	III	LC	-
Bufo bufo L., 1758	1	1	III	-	-	III	LC	-
Bufo viridis (Laur., 1768)	1	1	III	-	IV	II	LC	-
Hyla arborea (L., 1758)	2	2	III	-	IV	II	LC	-
Rana dalmatina Bonaparte, 1838	2	2	-	-	IV	II	LC	-
Rana graeca Boul., 1891	1	1	III	-	IV	III	LC	-
Pelophylax ridibundus (Pall., 1771)	3	3	IV	-	-	III	LC	-
Testudo graeca L., 1758	11	8	II,III	EN	II,IV	II	V	II
Testudo hermanni Gmel., 1789	14	4	II,III	EN	II,IV	II	NT	II
Ablepharus kitaibelii Bibron et Bory, 1833	11	7	III	-	IV	II	LC	-
Anguis fragilis L., 1758	5	4	III	-	-	III	-	-
Lacerta viridis (Laur., 1768)	14	8	III	-	IV	II	LC	-
Lacerta trilineata Bedriaga, 1886	1	1	III	-	IV	II	LC	-
Podarcis tauricus (Pall., 1814)	5	2	III	-	IV	II	LC	-
Podarcis muralis (Laur., 1768)	5	3	III	-	IV	II	LC	-
Coronella austriaca Laur., 1768	2	2	III	-	IV	II	-	-
<i>Dolichophis caspius</i> (Gmel., 1789)	6	5	III	-	IV	II	-	-
Zamenis longissimus (Laur., 1768)	7	4	III	-	IV	II	LC	-
Natrix natrix (L., 1758)	3	3	-	-	-	III	LR/lc	-
Vipera ammodutes (L., 1758)	3	3	Ш	-	IV	П	LC	-

Table 1. Species diversity of amphibians and reptiles recorded in NP "Sinite kamani". *Legend: L* – number of localities; *N* – number of 2×2 km UTM squares in which species was detected. Details on abbreviations for the conservation status are provided below the table.

BPA – Biodiversity Protection Act of Bulgaria (State Gazette, 2002). Annexes: II – Species whose conservation requires the designation of special areas for habitat protection; III – Species protected statewide; IV – Species under protection and regulated use.

RDB - Red Data Book of Bulgaria (2011). EN - Endangered species.

92/43 – Council Directive 92/43/EEC (CD92/43, 1992). Annexes: II – Species whose conservation requires the designation of special areas of conservation; IV – Species in need of strict protection.

BERN – Bern Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979). Appendices: II – Strictly protected fauna species; III – Protected fauna species

IUCN – International Union for Conservation of Nature, RedList (IUCN, 2014). V – vulnerable; NT - near threatened; LR/lc – Lower Risk/least concern; LC - least concern

CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1975). Appendix II - Species not necessarily now threatened with extinction but that may become so unless trade is closely controlled.

lations of amphibians is the presence of standing water (dams, lakes, ditches, water tanks, etc.). Maintenance of existing and creation of new ones is crucial. Negative impact for the populations of some species of frogs and tailed amphibians is the development of road infrastructure.

Major threat to populations of reptiles is the changes or destruction of their preferred habitats (for example forests dominated by oak and replacing them with conifers). Problem, which should be given particular attention, is the illegal collection of tortoises for sale or for consumption. Also the direct killing and collection by poachers and tourists: snakes, tortoises, lizards. As a result of poaching and collecting the reptilian populations deline drastically.

Another threat is fires and arson. The most severe losses have the slow-moving invertebrates, reptiles and amphibians.

Grazing cattle in the forests and overgrazing in farmland is another threat for the amphibians and reptiles. The negative effect of grazing is due mainly to goats. Goat grazing directly affects the undergrowth, the grass vegetation and prevents and stops natural regeneration of forests. Disturbance of wildlife is a factor with moderate effect. Disturbance caused by tourism, is able to compromise the reproductive process of a number of species, mainly reptiles in rocky habitats.

Recommendations

For preserving the populations of amphibians and reptile in the Nature Park we recommend the following:

- Conducting future studies on population dynamics and distribution of all recorded species.

- Creating small artificial ditches with water and maintenance of existing old ones to attract amphibians and facilitate their reproduction.

- Fencing of roads in the regions where tangent to the area and tunneling for unimpeded passage of reptiles and amphibians.

- Insufficient environmental awareness is often at the root of destructive attitude towards nature, which in turn leads to a reduction of populations, destruction of animals and plants and other priority species. Manifestation of this attitude are illegal hunting and fishing, dumping of waste outside designated areas, industrial pollution and construction waste, and fetched and irrational use of renewable natural resources. Conducting educational seminars and preparation of educational materials for the locals, would play a positive effect.

- Planning and implementation of effective control on the field and the application of strict penalties for offenders are required, both in domestic and in international environmental law.

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APPENDIX 1

Amphibian distribution in Nature Park "Sinite Kamani" and its surroundings with UTM codes (10x10 km), according to the available literature data

Salamandra salamandra - "In the mountain around Sliven" - MH42 (KOVATSCHEFF, 1903; BURESH & TSONKOV, 1941), "Sliven" - MH42 - (KOVACHEV, 1912), "The vicinity of Byala Town" - MH33 (УНДЖИЯН, 2000); Bufo bufo - "In the mountain near Sliven, under Kutelka Peak" - MH43 (BURESH & TSONKOV, 1942), "near Sliven" - MH42 (SPEYBROECK, 2005); Bufo viridis - ""Slivenski mineralni bani" near Sliven" - MH42 (EUZET et al., 1974); Pelophylax ridibundus - "near Sliven" - MH42 (SPEYBROECK, 2005).

APPENDIX 2

Reptile distribution in Nature Park "Sinite Kamani" and its surroundings with UTM codes (10x10 km), according to the available literature data

Testudo graeca - "The vicinities of Sliven" - MH42 (UNDZHIAN, 2000); Anguis fragilis - "Ablanovo, Sliven District" - MH42 (KOVACHEV, 1912; BURESH & TSONKOV, 1933), "Byala village, Sliven District" - MH33 (BURESH & TSONKOV, 1933), "Stara Planina Mnt. near Sliven" - MH42 (BESHKOV, 1966); Lacerta viridis - "Sliven" - MH42 (KOVACHEV, 1912; LEHRS, 1931; BURESH & TSONKOV, 1933; DRENSKI, 1955; SPEYBROECK, 2005), "Byala village, Sliven District" - MH33 (BURESH & TSONKOV, 1933); Podarcis tauricus - "Slivenskite bani" - MH42 (KOVACHEV, 1912; BURESH & TSONKOV, 1933); Podarcis muralis - "near Sliven" - MH42 (SPEYBROECK, 2005); Dolichophis caspius - "Sliven" - MH42 (KOVACHEV, 1905; BURESH & TSONKOV, 1933); Podarcis muralis - "near Sliven" - MH42 (SPEYBROECK, 2005); Dolichophis caspius - "Sliven" - MH42 (KOVACHEV, 1905; BURESH & TSONKOV, 1934); Zamennis longissimus - "Sliven" - (KOVACHEV, 1905; 1912; BURESH & TSONKOV, 1934), "Sotirya" - MH52 (KOVACHEV, 1917); Coronella austriaca - "Sliven" - MH42 (KOVACHEV, 1912; BURESH & TSONKOV, 1934), "Ablanovo, Sliven District" - MH43 (BURESH & TSONKOV, 1934), "Sotirya" - MH52 (KOVACHEV, 1914; BURESH & TSONKOV, 1934), "Byala village, Sliven District" - MH43 (BURESH & TSONKOV, 1934), "Ablanovo, Sliven District" - MH42 (KOVACHEV, 1912; BURESH & TSONKOV, 1934), "Byala village, Sliven District" - MH43 (BURESH & TSONKOV, 1934); Natrix natrix - "Sliven vicinities" - MH42 (BURESH & TSONKOV, 1934); Vipera ammodytes - "Sliven" - MH42 (KOVACHEV, 1905; 1912; BURESH & TSONKOV, 1934); Vipera ammodytes - "Sliven" - MH42 (KOVACHEV, 1905; 1912; BURESH & TSONKOV, 1934); Vipera ammodytes - "Sliven" - MH42 (KOVACHEV, 1905; 1912; BURESH & TSONKOV, 1932).

APPENDIX 3

Amphibian distribution in Nature Park "Sinite Kamani" with UTM codes (2x2 km), based on the recorded localities in the current study

Salamandra salamandra - MH41-E5, MH42-D5, MH43-A1, MH53-C1; Bufo bufo - MH53-C2; Bufo viridis - MH52-A5; Hyla arborea - MH41-E5, MH53-C2; Rana gaeca - MH53-C2; Rana dalmatina - MH41-E5, MH42-A5; Pelophylax ridibundus¹ - MH41-E5, MH42-C5, MH42-E5 and others.

APPENDIX 4

Reptile distribution in Nature Park "Sinite Kamani" with UTM codes (2x2 km), based on the recorded localities in the current study

Ablepharus kitaibelii - MH41-E5, MH42-A5, MH42-B5, MH42-C5, MH43-B1, MH43-D1, MH52-D4; Anguis fragilis - MH42-A5, MH43-E1, MH43-E2, MH43-D1; Coronella austriaca - MH52-C4, MH53-A2; Dolichophis caspius - MH41-E5, MH42-B5, MH42-C5, MH42-D5, MH42-E4; Lacerta trilineata - MH42-C4; Lacerta trilineata - MH41-E5, MH42-D5, MH42-B5, MH42-C4, MH42-C5, MH42-E4, MH43-B1, MH53-B2; Natrix natrix - MH42-C5, MH43-E1, MH52-E4; Podarcis muralis - MH41-E5, MH42-D5, MH42-D1, MH52-D4; Podarcis tauricus - MH42-A5, MH42-B5; Testudo graeca - MH41-E5, MH42-A5, MH42-C4, MH42-C5, MH42-D5, MH42-E5, MH52-D4; Testudo hermanni - MH42-D4, MH42-E4, MH42-E5, MH52-D4; Zamennis longissimus - MH42-C5, MH42-E4, MH42-E5, MH42-C5, MH42-A5.

¹ *Pelophylax ridibundus* is abundant and frequently met in many aquatic habitats throughout the territory of the Nature Park, so most of its localities were not recorded.

APPENDIX 5 Amphibians from Nature Park "Sinite Kamani" (photographs)



A – Fire salamander (*Salamandra salamandra*) from "Lokvata" area. Photo: A. Mechev.

B - Marsh Frog (*Pelophylax ridibundus*) from the southern parts of the park. Photo: A. Mechev



C - Greek Stream Frog (*Rana graeca*) from ecotone area woody-shrub/grass vegetation, aprox. 900 m south from Ichera Village (818 m a.s.l.), 24.5.2014. Photo: A. Mechev

APPENDIX 6 Reptiles from Nature Park "Sinite Kamani" (photographs)



A – Spur-thighed Tortoise (*Testudo graeca*) from "Sinite Kamani" Nature Park. Photo: S. Deleva

B – Slow Worm (*Anguis fragilis*) from "Sinite Kamani" Nature Park. Photo: B. Borisov.



C - Eastern Green Lizard (*Lacerta viridis*) from "Sinite Kamani" Nature Park. Photo: B. Borisov

D - Aesculapian Snake (Zammenis longissimus) from"Sinite Kamani" Nature Park. Photo: S. Deleva



E – Grass Snake (*Natrix natrix*) from "Sinite Kamani" Nature Park. Photo: S. Deleva.

F – Nose-horned Viper (*Vipera ammodytes*) from"Sinite Kamani" Nature Park. Photo: S. Deleva