

The Herpetofauna (Amphibia and Reptilia) of Vrachanska Planina Mountains - Species Composition, Distribution and Conservation

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Abstract. Vrachanska Planina Mts. is located in northwestern Bulgaria and is a relatively well-defined part of Stara Planina Mts. So far, no comprehensive studies on the species composition and distribution of the herpetofauna of Vrachanska Planina Mts. have been published. The current study reports 8 new species of amphibians and reptiles, which are new for the region and confirms all previously known 19 species. All species localities have been mapped in the UTM-grid (1×1 km). The spatial distribution, as well as the vertical distribution and the species richness are analyzed. The importance of the existing protected areas in Vrachanska Planina Mts. and protected Natura2000 zones for the conservation of herpetofauna are discussed. Some potential threats to amphibians and reptiles in the research area (such as drying-up of water basins, fires and road mortality) are reported.

Key words: Amphibia, Reptilia, distribution, conservation, Bulgaria, Vratsa.

Introduction

Over the past 15 years a number of scientific publications, dealing with the herpetofauna of particular geographic regions in Bulgaria have been published (e.g. Sakar Mts. - Stoev 2000, Rusenski Lom Region - Undjian 2000, Kresna Gorge - Petrov & Beshkov 2001, Eastern Rhodopes Mts. - Petrov 2004, Western Rhodopes Mts. - Petrov *et al.* 2006, Blagoevgrad Region - Pulev & Sakelarieva 2009, 2011a, b, Besaparski Ridove Heights - Popgeorgiev *et al.* 2010; Ponor Mts. - Popgeorgiev *et al.* 2014, Northern Black Sea Coast - Tzankov *et al.* 2009; Rilska Tiver Basin - Tzankov *et al.* 2011; Vitosha Mts. - Tzankov *et al.* 2014, Sinite Kamani Nature Park - Deleva *et al.* 2014), and in the book of Stojanov *et al.* (2011) were presented up-to-date maps of the distribution of the amphibians and reptiles at the national level. However, regional distribution and species composition of the Bulgarian herpetofauna cannot be considered to have been fully explored.

Almost all amphibian and reptile species, occurring in the country are legally protected under the Bulgarian and EU laws. A significant role in the species' protection play especially the protected areas and national and nature parks, because of their relatively large area. Although the parks in Bulgaria have developed management plans, the scientific publications on their herpetofauna are scarce. Of particular interest in this regard is the work of Tzankov *et al.* (2014), analyzing in detail the distribution and habitats of the amphibians and reptiles in the Vitosha Mts., much of which falls within the Nature Park "Vitosha"'s territory.

The herpetofauna of Vrachanska Planina Mts. was studied in relation with the preparation of the management plan for Nature Park "Vrachanski Balkan" in 2006, but the results have not been published. Individual locations of some species have been reported by Buresh & Zonkow (1932, 1934), Beshkov (1961, 1970), Tzankov & Stoyanov (2008), Naumov *et al.* (2011), etc., but generally the mountain can be considered poorly explored in herpetological terms.

The current study aims to clarify the species composition and richness, to analyze and to present contemporary maps of the distribution of the amphibians and reptiles in Vrachanska Planina Mts.

Material and Methods

Study area

Vrachanska Planina Mts. Is relatively well-defined part of the Western Stara Planina Mts. and according to the administrative division of Bulgaria it is situated in the districts Vratsa, Montana and Sofia.

In the available literature there are no well-defined descriptions of the borders of Vrachanska Planina Mts. Generally it is accepted that (according to Nikolov & Jordanova, 2002) Vrachanska Planina Mts. extends northeast of Dupnivrashka (Druzhevska) Ravine between Botunya River and Iskar River. The massif, which ends with the Lakatnishki Rocks in south and is separated by Mushatski Dol Ravine (Petrovski Dol Ravine) from the west and Turski Dol Ravine (Milanovska River) from the east, usually is not considered part of Vrachanska Planina Mts. (see Nenov & Chorchofov 1987, Vatkov 1987). In our opinion however, in orographic relation, this massif is more related to Vrachanska Planina Mts., rather than Koznitsa Mts., so we consider it part of Vrachanska Planina Mts. In the current paper we define the following borders of Vrachanska Planina Mts.: 1) from west to northwest – from the mouth of Proboynitsa River along its flow to the mouth of Petranski Dol River (called Mushatski Dol River in its upper part) and against the flow of Druzhevska Ravine and from there following Bela Reka River to its inflow into Botunya River; from there following Botunya River to its inflow into Matnitsa River; 2) from northeast – from the mouth of Matnitsa River against its flow of the confluence of a nameless left tributary and against its course to the southeast to level 280, from there along the Bela Bara River to its mouth, then upstream of Leva River. to isohypsis 400, then along the same isohypsis southeast to Darvodeltsi River and along the flow of the same river to its mouth; 3) from south – from the mouth of Darvodeltsi River, against the flow of Iskar River to the mouth of Proboynitsa River. In so defined boundaries, the study region (Fig. 1) covers an area of about 412 km², the lowest point is the mouth of the Matnitsa River (180 m a.s.l.), and the highest - Beglichka Peak (1482 m a.s.l.).

Vrachanska Planina Mts. consists mostly of Mesozoic, highly karst limestone. The ridge is wide and undulating, with numerous karst formations. The slopes are steep, often covered with screes (Kiradzhiev 1999, Nikolov & Jordanova 2002).

The climate is transitional between temperate and mountainous. The average annual temperature is 7°C. Rainfall is highest in May-June and lowest in February and August. The average annual rainfall reaches 1000 mm. The largest rivers with perennial flow are Leva River, Cherna River and Zlatitsa River, while the other rivers and streams often dry

up. Typical for the mountain are numerous springs, which also have a constant flow and are affected by the rains and melting snow (Vatkov 1987).

According to the classification of CORINE Land Cover (CLC 2006)¹ in Vrachanska Planina Mts. are dominating territories covered with forests and semi-natural vegetation (Class 3) - in average 78.15% of the total survey area, including forests (Class 3.1) – 47.33%, shrub and/or grass associations (Class 3.2) – 28.62% and open areas with scarce or no vegetation (Class 3.3) – 2.20%. Agricultural land (Class 2) occupies about 18.50% of the area of the region, and artificial land cover (Class 1) - about 2.20%.

Within the research area completely or partially fall the borders of Nature Park “Vrachanski Balkan” (about 292,5 km² of the territory of the mountain), reserve “Vrachanski Karst” (14,4 km²), 5 protected areas and 5 natural monuments (in total about 13 km²), and 4 protected zones for habitats from the Natura 2000 network (in total 342,8 km² of the mountain territory) (according to the “Register of protected territories and protected zones in Bulgaria”, available at: <http://eea.government.bg/en>).

Data sources

For the purposes of the current study all documented observations of amphibians and reptiles from field studies of the authors in the territory of Vrachanska Planina Mts. are used, as well as those provided by colleagues. The time period of data collection is from 1955 to 2014, but the main amount of data (over 95% of the total) was collected after 1990s. All available scientific literature on Bulgarian herpetofauna (over 700 titles) has been reviewed and all data that refer or can be referred to the research area and meet the objectives of the current study are also used.

Databases, mapping and analysis

Most of the data (over 96% of the total) have precise geographic coordinates taken with GPS-receiver, derived from interactive satellite images (Google Earth 7.1.2) or interactive topographic maps with a scale of 1:50000 (Geographic Information System Works, <http://gis.mrrb.government.bg/MRRB/>). The data are unified and united in a single database where each unique record meets the registration of one or more individuals of a given species in a given place, a distance of not less than 10 meters from another. Entries that have precise geographic coordinates are referred to as “locations” hereinafter in the text. The altitude of the location is derived from the DEM² based on their coordinates. The database also includes part of the known from literature localities - those with geographic coordinates or localities that can be correctly mapped, based on their descriptions. The total number of records (unique registrations of species) in the database is 1481. The places where the individual species are found are described based on the distance and direction to the nearest village (by precision 0,1 km and one of the eight major and secondary geographic directions). In this sense, any kind of place whose description differs from other such locality by the name of the settlement, distance or direction (see the electronic Annex on: [http://www.zoonotes.bio.uni-plovdiv.bg/additions/Herpetofauna Vr Mts.xlsx](http://www.zoonotes.bio.uni-plovdiv.bg/additions/Herpetofauna_Vr_Mts.xlsx)) is regarded as a separate locality. One locality may refer to one specific area, or several

¹ The ratio of the area is made in GIS-environment, based on overlaying the borders of the studied area with the vector layer of CLC2006, available online at: <http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-2>.

² Digital Elevation Model (a raster layer with resolution 40 × 40 m)

such localities, located in close proximity to one another, or it can reflect literature data without coordinates. With respect to the literature data, which cannot be mapped in the selected resolution, each unique geographical object is considered as a separate locality. This type of data is taken into account only in the context of reports of the presence of the species in the area but not included in the analyses.

Mapping of the distribution of the species is made in UTM¹ grid with a resolution of 1 × 1 km in the projection coordinate system “WGS 84 UTM 35N” and presented by centroids of squares, in which locations of the species fall. The codes of a 10x10 km squares (Fig. 1) are based on MGRS² in UTM Zone 34T, and those of the one-kilometer follow the same logic as the last two digits encode each one-kilometer square within that ten kilometers. Total one-kilometer squares, which falls in the studied area is 476, 349 of which are whole and 127 are partial.

Mapping, spatial data processing and visualization of maps are made by the program ArcGIS 10.1 (ESRI, Redlands, California, USA). Statistical parameters - median and percentiles used to describe the vertical distribution, are derived based on locations (n = 1430) of species, derived using the program STATISTICA (StatSoft Inc. 2011).

Taxonomic notes

The used Latin names of species are following mainly Stojanov *et al.* (2011), as the following subsequent taxonomic changes are reflected: 1) in respect of the species *Hyla arborea* complex, preliminary data indicate that in most of the country (incl. North Bulgaria) occurs the species *H. orientalis* (Gvoždik *et al.* 2015, Dufresnes *et al.* 2015); 2) regarding the representatives of the genus *Bufo* Rafinesque 1814, there is still no data on the taxonomic status of the Bulgarian populations and thus the recorded specimens from this species in Vrachanska Planina Mts. are given under the combination *Bufo viridis* (Laurenti, 1768), but with the addition of “complex”; 3) regarding the representatives of the genus *Anguis* Linnaeus 1758, only the name *Anguis colchica*, is used because all specimens found in the area have diagnostic features corresponding to this taxon.

¹ Universal Transverse Mercator

² Military Grid Reference System (spatially identical with UTM)

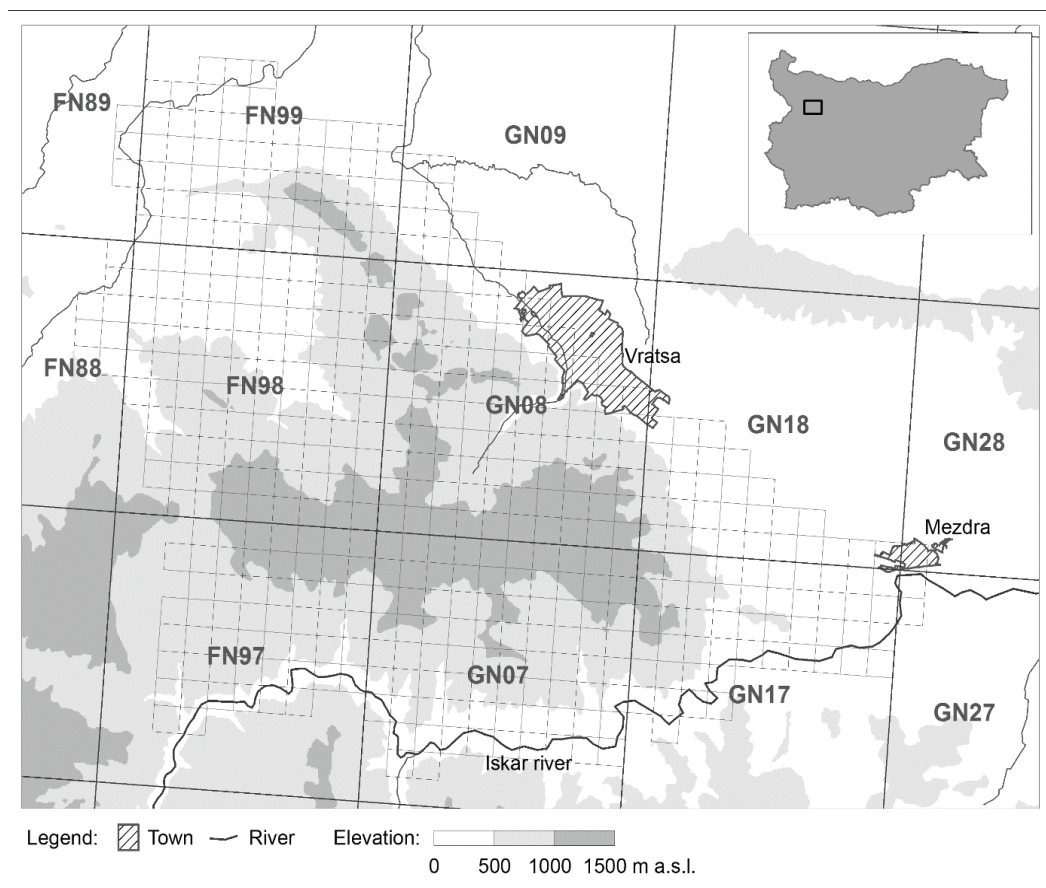


Fig. 1. Location of the study area in UTM-grid 10×10 and 1×1 km (from the one-kilometer squares are shown only the ones, in which falls the territory of Vrachanska Planina Mts.)

Results and Discussion

Species composition

Based on literary data there are 19 species of amphibians and reptiles (in 17 scientific publications issued between 1905 and 2011), reported for Vrachanska Planina Mts. As a result of our studies we confirmed the presence of each one of them and we identified 8 new species for the study area, bringing the total number of species which are known for the region, to 27, including 11 amphibians and 16 reptiles (below is given a list of registered species by classes, orders and suborders). The study area is characterized by the almost complete absence of species that are typical for the highest mountains in the country. From this group we recorded only one representative - *Rana temporaria*. Specific for the region is the presence of *Triturus cristatus* – a species established only in the northwest part of the country (Tzankov & Stojanov 2008, Wielstra *et al.* 2013). The species richness of Vrachanska Planina Mts. is higher than the adjacent Ponor Planina Mts. (20 species according to Popgeorgiev *et al.* 2014) and its species richness is comparable to that of

Vitosha Mts. (27 species according to Tzankov *et al.* 2014).

Having in mind the contemporary ideas for the overall distribution of the Amphibians and Reptiles in Bulgaria (see Stojanov *et al.* 2011) in our opinion finding other species in Vrachanska Planina Mts. can be considered unlikely, except in respect of the genus *Bombina* Oken 1816. Beškov *et al.* (1967) reported finding a *Bombina bombina* (Linnaeus 1761) at Brusen Village, which is located about 3 km from the eastern point of the study area. Although the locality has not been confirmed, it should be noted that it is likely to find this species in the easternmost parts of the mountain, where there are suitable habitats.

According to the distribution maps of the venomous snakes in Bulgaria, given by Buresch & Zonkow (1932) it appears that there is a locality of *Vipera berus* (Linnaeus, 1758) in Vrachanska Planina Mts. This locality is not the result of the authors' own data, but is quoted by an older source. When analyzing the origin of the data apparent discrepancy was noted. Kovachev (1905) reported *V. berus* locality "Vratza (Milin Kamak)". In a later publication the same author (Kovachev, 1912) in the listing the locations of *V. berus* in Bulgaria did not mention this locality, but the same place is given as a locality of *V. ammodytes*. Buresch & Zonkow (1932) quoting Kovachev (1905) refer to the locality of "Milin Kamak" for *V. berus*, but perceive the corresponding peak as part of Vrachanska Planina Mts., while on the map the symbol that corresponds to this locality is placed at a considerable distance (southwest) from the actual location of Milin Kamak Peak. In later study of the same authors (Buresch & Zonkow 1934), the locality is mapped in the same way, but this time with indicated altitude - 1200 m, which is also significantly different from the real altitude of the peak. Milin Kamak Peak is located about 13 km northeast of Vratsa Town and its maximum altitude is 463 m a.s.l. Having in mind the study of Stojanov *et al.* (2011) for the distribution and habitats of *V. ammodytes* and *V. berus* in Bulgaria, it seems much more likely that the locality "Milin Kamak" refers to *V. ammodytes* (as given by Kovachev, 1912), and not *V. berus*. The nearest certain localities of *V. berus* are in Ponor Mts. (see corresponding map in Popgeorgiev *et al.* 2014) and Koznitsa Mts. (namely Todorini Kukli Peaks, according to Kovachev (1912) and Westerström *et al.* (2010)), respectively about 13 km southwest and 15 km west from the boundaries of Vrachanska Planina Mts. In our opinion the existence of *V. berus* in Vrachanska Planina Mts. cannot be considered as proven and the species is not included in the checklist of the herpetofauna of the study area.

Checklist of the amphibians and reptiles in Vrachanska Planina Mts.

Classis Amphibia

Ordo Caudata

Salamandra salamandra (Linnaeus 1758) – this study

Lissotriton vulgaris (Linnaeus 1758) – Tzankov & Stoyanov (2008); this study

Triturus cristatus (Laurenti 1768) – Kowatscheff (1905)*; Kovachev (1912)*; Buresch & Zonkow (1941)*; Tzankov & Stoyanov (2008); this study

Triturus ivanbureschi Arntzen et Wielstra 2013 – this study

Ordo Anura

Bombina variegata (Linnaeus 1758) – Buresch & Zonkow (1942); Beškov (1972); this study

Bufo bufo (Linnaeus 1758) – Beškov (1972); this study

Bufo viridis complex – Beškov (1972); this study
Hyla orientalis Bedriaga 1890 – Tzankov & Stoyanov (2008); this study
Pelophylax ridibundus (Pallas 1771) – Tzankov & Stoyanov (2008); this study
Rana dalmatina Fitzinger 1839 – Tzankov & Stoyanov (2008); this study
Rana temporaria Linnaeus 1758 – this study

Classis Reptilia

Ordo Testudines

Emys orbicularis (Linnaeus 1758) – this study
Testudo graeca Linnaeus 1758 – Beškov *et al.* (1967); this study
Testudo hermanni Gmelin 1789 – this study

Ordo Squamata: Subordo Sauria

Anguis colchica (Nordmann 1840) – Buresch & Zonkow (1933); Beškov (1966); this study
Ablepharus kitaibelii Bibron et Bory de St-Vincent 1833 – Beškov (1961); this study
Darevskia praticola (Eversmann 1834) – Naumov (2005); this study
Lacerta agilis Linnaeus 1758 – this study
Lacerta viridis (Laurenti 1768) – this study
Podarcis muralis (Laurenti 1768) – Buresch & Zonkow (1933); this study
Podarcis tauricus (Pallas 1814) – this study

Ordo Squamata: Subordo Serpentes

Coronella austriaca Laurenti 1768 – Kovachev (1905, 1912); Buresch & Zonkow (1934); this study
Dolichophis caspius (Gmelin 1789) – Beshkov (1964); this study
Natrix natrix (Linnaeus 1758) – Buresch & Zonkow (1934); this study
Natrix tessellata (Laurenti 1768) – Naumov *et al.* (2011); this study
Zamenis longissimus (Laurenti 1768) – Kovachev (1905, 1912); this study
Vipera ammodytes (Linnaeus 1758) – Kovachev (1905); Buresch & Zonkow (1932, 1934); Beškov (1961); Christov & Beshkov (1999); this study

* The species affiliation of the crested newts from the localities „Vratza“, „Vratza (Skaklya)“ and „The puddles near Vratza“ (given by Kowatscheff (1905), Kovachev (1912) and Buresch & Zonkow (1941), respectively) is not exactly known, but in the current study they are given as *T. cristatus*.

Distribution

Currently, for all recorded species of amphibians and reptiles in Vrachanska Planina Mts. there are totally 1276 known localities, of which 1236 are new, eight are mentioned in literature and confirmed with new data, and only 32 are based only on literary data (in Appendix 1 is given a table with the total number of species and localities and origin of the data for the individual species). The total number of the known localities that can be correctly mapped into the one-kilometer UTM-network is 1255. The mapped localities for all species fall within 236 squares (Fig. 2), which is about 50% of the number of squares, falling within the Vrachanska Planina Mts. The least explored territories are distributed: 1) in the western part - the massif between the Bela River and Cherna River; 2) in the central part - the area between Buk Peak and Okolchitsa Peak; 3) in the eastern part - the area between Chelopek Village and Mezdra Town.

Figure 3 shows the ratio of the number of squares, where species have been recorded and the total number of squares from which there is data about amphibians and reptiles in the study area. The largest number of squares with established presence was observed in two species of reptiles - *Podarcis muralis* and *Lacerta viridis*, and two species of amphibians - *Pelophylax ridibundus* and *Bombina variegata*. Given the nature of their distribution (see below), these four species can be considered the most common representatives of the herpetofauna in Vrachanska Planina Mts.

The distribution of registered locations of the species according to the altitude is shown in Fig. 4 and is discussed separately for the main systematic groups.

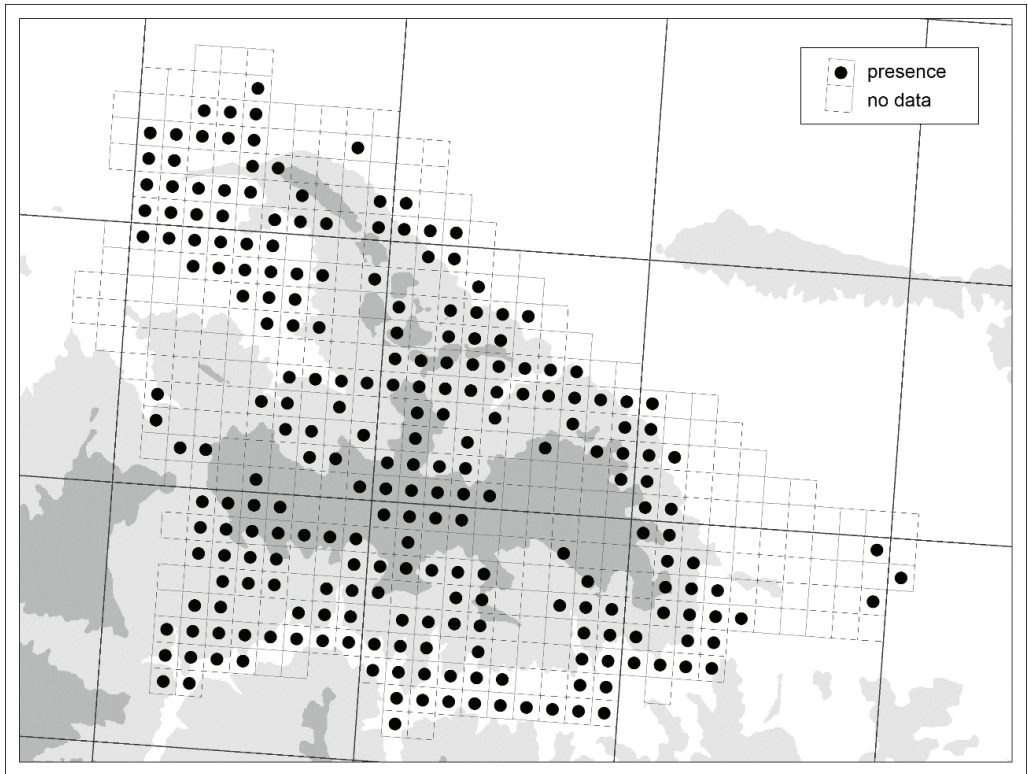


Fig. 2. Distribution of all known localities of amphibians and reptiles in Vrachanska Planina Mts. in UTM-grid 1×1 km.

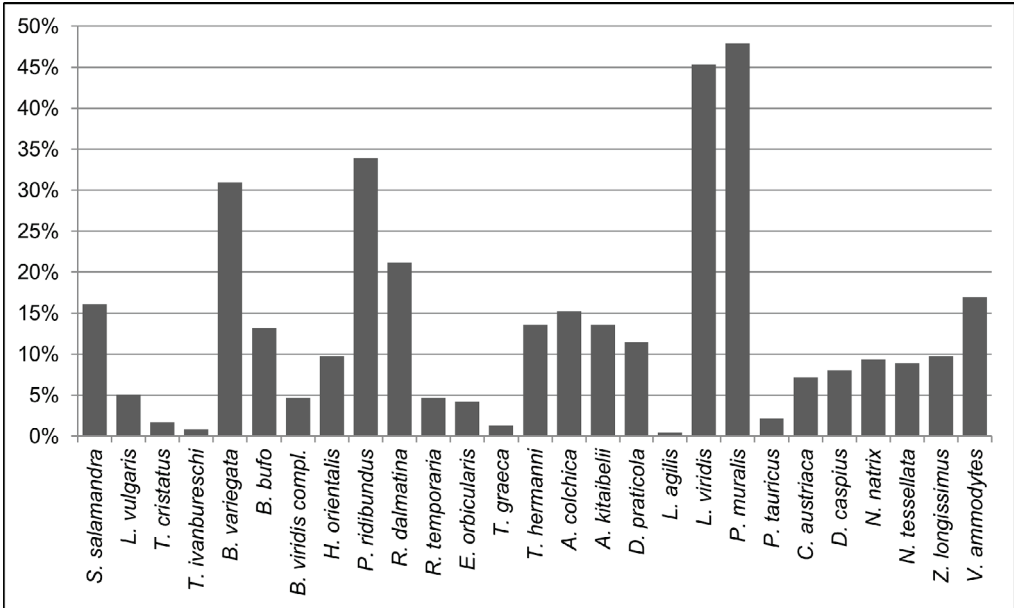


Fig. 3. Percentage ratio of the number of UTM-squares, in which there are recorded species and the total number of squares (n=236) with registered presence of amphibians and reptiles in Vrachanska Planina Mts.

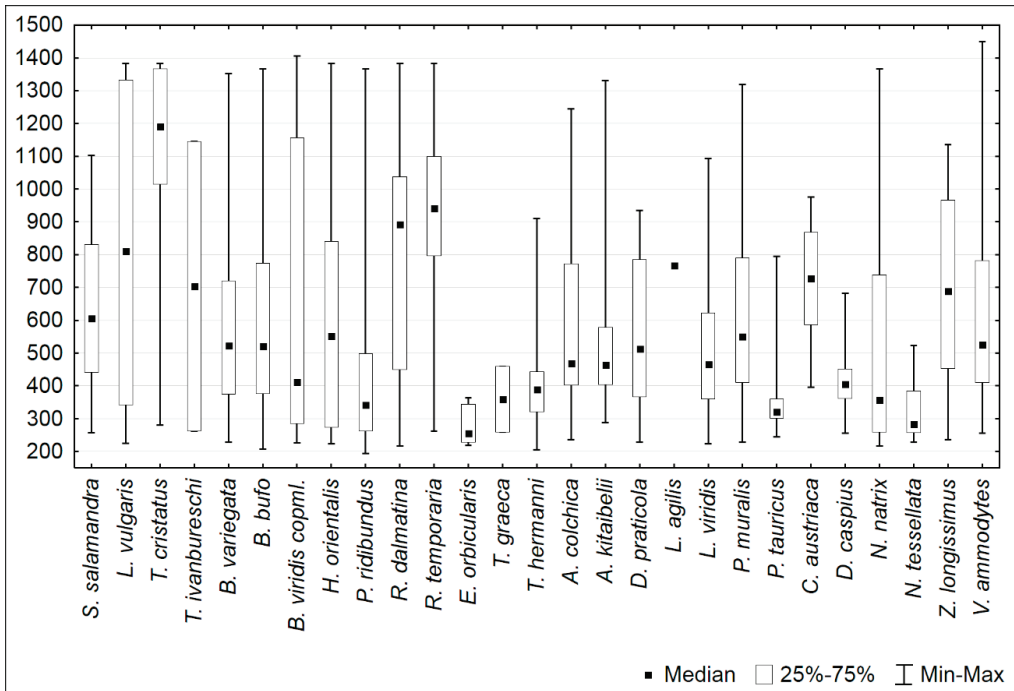


Fig. 4. Altitude distribution of the localities (n=1427) of the species of amphibians and reptiles in Vrachanska Planina Mts.

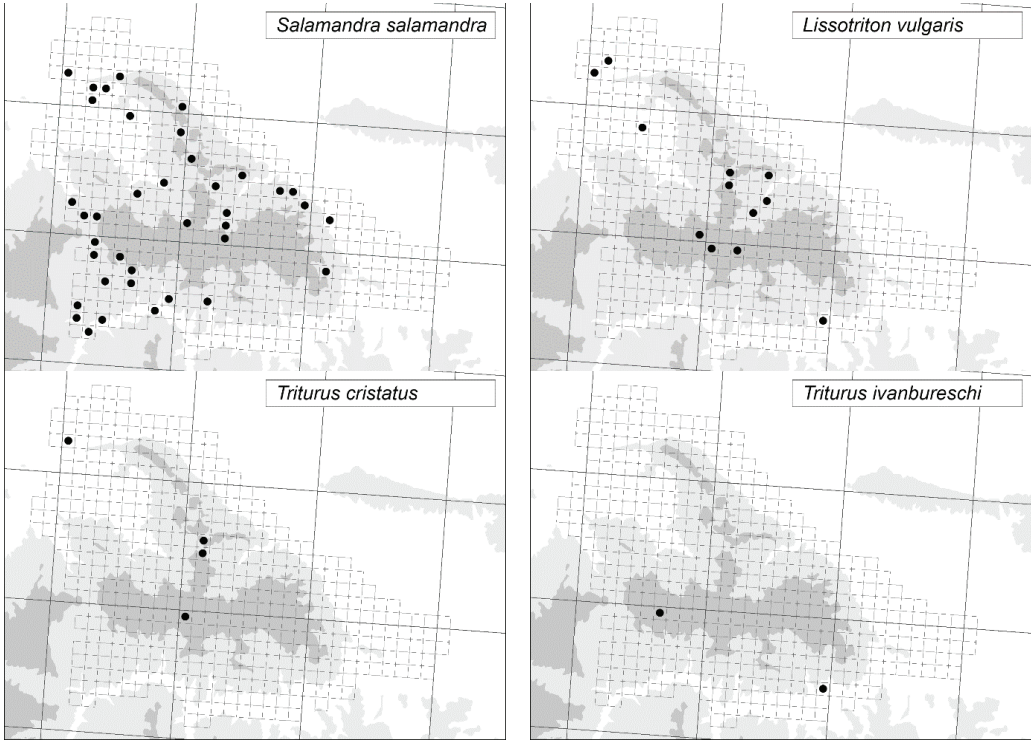


Fig. 5. Maps of the distribution of the amphibians from the order Caudata in Vrachanska Planina Mts. (UTM-grid 1×1 km).

Amphibians - Order Caudata

The tailed amphibians in Vrachanska Planina Mts. are presented with four species as all known localities fall in 48 UTM-square (Fig. 5). The individual species seem to have different pattern of distribution, although in all species a comparatively wide elevation range was observed (Fig. 4). *Salamandra salamandra* probably occurs everywhere, where there are suitable habitats, while the distribution of the newts is more sporadic. This can be explained by species-specific requirements to the nature of the ponds for breeding (see Stojanov *et al.* 2011) - *S. salamandra* breeds mainly in streams, springs, fountains etc., which can be seen throughout the territory of the mountain. The crested newts breed exclusively in standing water bodies, which are scarce in the area. *Lissotriton vulgaris* also prefers standing waters, but it can breed in very small water basins, such as puddles in the road ruts, ditches, water fountains, etc. and sometimes even small streams (5 adult individuals were observed in a small stream 1 km north of Zgorigrad Village on 05.26.1998 by K. Donchev). Regarding *Triturus cristatus* and *T. ivanbureschi* - the absence of the first species from the southern part of the mountain, and the absence of the second species from the north, can be explained with the patterns of the areals of the two species. The localities of *T. cristatus* in Vrachansk Planina Mts. mark the southernmost line of the species range (Tzankov & Stoyanov 2008) and the localities of *T. ivanbureschi* outline the most northwestern limit of the species range in Bulgaria. In this sense, the territory of Vrachanska Planina Mts. can be regarded, as the contact area between the two taxa. An evidence for the last statement is the study by Wielstra *et al.* (2013) who recorded introgression of mtDNA from *T. ivanbureschi* in specimens of *T. cristatus*, caught in the basin, north of Ochindol Village (UTM: GN0709) and Kalna Matnitsa Cave (Toshovata Dupka Cave) northeast of Stoyanovo Village (UTM: FN9902).

Amphibians - Order Anura

We recorded 8 anuran species from 4 families in the study area. All known localities fall in totally 153 UTM squares (Fig. 6). With highest number of localities are *Pelophylax ridibundus* and *Bombina variegata*. The first species is recorded in all parts of the study area and the second one is found only in the most eastern and northern parts of the mountain, which are with the lowest altitude (but are least researched). It must be noted, that some peculiarities in the biology and the ecology of some anurans can be a prerequisite to subjective assessment of their distribution: *P. ridibundus* and *B. variegata* remain near the water throughout almost the whole year, while the other 5 species, as a rule leave the water basin right after the breeding season and throughout the rest of their active season they inhabit the dry land, where they are active mainly during the night (especially the toads).

That makes them harder to spot than *P. ridibundus* and *B. variegata*. Amongst the other anurans, recorded in Vrachanska Planina Mts. *Rana dalmatina*, *Hyla orientalis*, *Bufo bufo* and *Bufo viridis* complex are spread widely, as the absence of localities of the two toad species in the eastern part of the mountain is probably due to the lower research rate of this. All species have very wide vertical distribution (Fig. 4), covering almost completely the altitude range of the study area. However, most of the locations of *B. variegata*, *B. bufo* and *H. orientalis* are concentrated under 800 m a.s.l. and those of *P. ridibundus* - below 500 m a.s.l. *R. temporaria* on the other hand is recorded mainly above 800 m a.s.l.

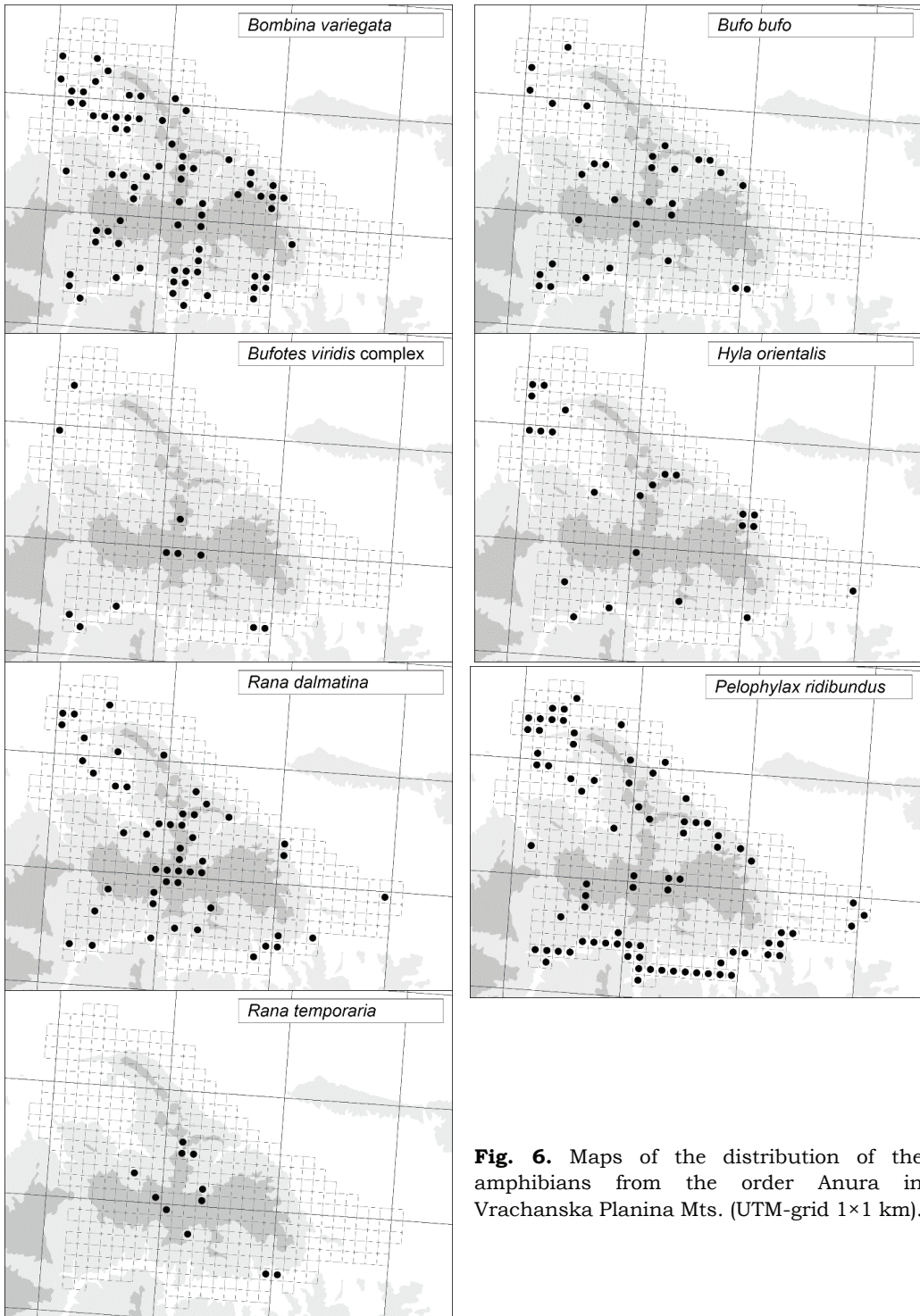


Fig. 6. Maps of the distribution of the amphibians from the order Anura in Vrachanska Planina Mts. (UTM-grid 1×1 km).

The registered patterns in the vertical distributions of the species is related to the availability of suitable breeding basins and the species, which are more unassuming in this matter (namely *B. viridis* complex and *R. dalmatina*), show the widest vertical range. Specific distribution in Vrachanska Planina Mts. seems to have only *R. temporaria*, which is found mainly in the central, highest part of the mountain. The localities northeast of Zverino Village (UTM: GN1704 and GN0794) are small water basins (260 m a.s.l.), in which the species is recorded multiple times, during the breeding season. Meanwhile, these localities represent the places with the lowest altitude of the species in Bulgaria (Stojanov *et al.* 2011). Having in mind the described by Beshkov & Angelova (1981) ability of *R. temporaria* to perform long migrations to suitable breeding ponds and back to terrestrial habitats, it can be assumed that in this case we observed a similar phenomenon: during most of the year the frogs probably inhabit the ridges of the mountains north of Zverino Village (this part of the mountain is poorly studied), but due to lack of suitable breeding sites in the nearby surroundings, the frogs make annual migrations to the mentioned above waters basins.

Reptiles – Order Testudines

We recorded 3 species of turtles from two families in Vrachanska Planina Mts., where the known total localities fall in 39 UTM squares (Fig. 7). All three species have relatively narrow vertical ranges (Fig. 4) and are absent from the highest central parts of the mountain. *Emys orbicularis* is distributed in the northwestern part of the study area (Botunya River and its tributaries) and sporadically in Iskar River. This species occurs in low vertical range of locations (below 400 m a.s.l.) and the nature of its distribution may be determined by the lack of suitable water basins in the higher parts of the mountain (the ponds near Parshevitsa challet are over the maximum altitude for the species in the country, up to about 1100 m a.s.l., according Stojanov *et al.*, 2011). The largest number of localities was identified for *Testudo hermanni* and they are mainly concentrated in the northwestern part of the study area and to a lesser extent along Iskar River. Particularly interesting are the localities of *T. graeca*, as Vrachanska Planina Mts. is located outside the main range of the species in Bulgaria (see Stojanov *et al.*, 2011). In all three known localities of this species we recorded only single specimens (see Fig. 7): FN9902 - 1 ind. (Beshkov *et al.*, 1967); FN9961 - remains of shells under the nests of birds of prey (found in the late 80s and in the late 90s of the twentieth century, respectively R. Todorov and Georgi Stoyanov); FN9941 - single egg (in July 2006, obs. D. Stoyanov and B. Petrov). It should be noted that tortoises are often involuntarily resettled by people and currently we cannot decide, whether the found *T. graeca* are part of small numbered, local population or are resettled from elsewhere.

Reptiles – Order Squamata: Suborder Sauria

In the study area we recorded seven lizard species from three families. All known localities fall in 169 UTM squares (Fig. 8). The registered range of vertical distribution (Fig. 4) is wide in *Anguis colchica*, *Ablepharus kitaibelii* and *Podarcis muralis*, while the other species are limited to some extent, possibly because of specific habitat preferences. The largest number of known localities belongs to *Podarcis muralis* and *Lacerta viridis*, the second species does not seem to occur in the highest part of the mountain. Three other species - *Anguis colchica*, *Ablepharus kitaibelii* and *Darevskia praticola* are met sporadically throughout the mountain. The distribution of the remaining two species of lizards seems to be very limited.

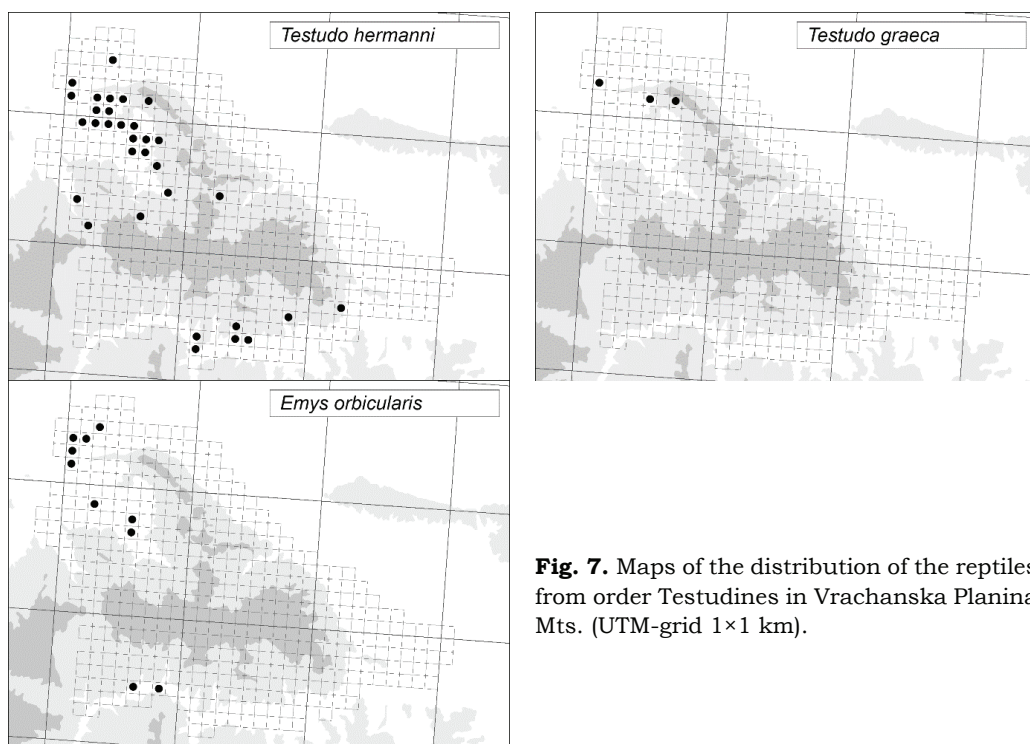


Fig. 7. Maps of the distribution of the reptiles from order Testudines in Vrachanska Planina Mts. (UTM-grid 1×1 km).

The localities of *Podarcis tauricus* likely outline the boundary of penetration of the species from the Danube Plain southward towards the Stara Planina Mts. The locality near Chelopek Village (GN1718; 795 m a.s.l.) is one of the highest known localities of this species in Bulgaria (according Stojanov *et al.* 2011 *P. tauricus* usually does not reach 500 m a.s.l., and only in Slavyanka Mts. is limited to about 1000 m a.s.l.). *Lacerta agilis* is known from Vrachanska Planina Mts. by only one specimen found in Milanovo Village (16.06.1999, obs. V. Beshkov). Subspecies affiliation of the observed specimen has not been identified. In the neighbouring Ponor Planina Mts. and in the higher parts of the western Stara Planina Mts., located northwest of Vrachanska Planina Mts., only *L. a. bosnica* Schreiber, 1912 occurs (see Popgeorgiev *et al.* 2014 and Stojanov *et al.* 2011).

Reptiles – Order Squamata: Suborder Serpentes

In Vrachanska Planina Mts. six snake species from two families are registered. All known localities fall in total 91 UTM squares (Fig. 9). Two species - *Dolichophis caspius* and *Natrix tessellata*, seem to be absent from the high central part of the mountain, which can be explained by the influence of the altitude on the climatic conditions, as well as the lack of suitable habitats. Both species are widespread in Bulgaria, but as a rule prefer low and warm areas. *Dolichophis caspius* usually reaches 800-1100 m a.s.l. (Stojanov *et al.*, 2011), although in Southwestern Bulgaria is located up to 1580 m a.s.l. (Beškov, 1974). *Natrix tessellata* reaches 1420 m a.s.l. in Southwest Bulgaria (Tzankov *et al.*, 2011), but not in North Bulgaria, where all localities are below 700 m a.s.l. (Naumov *et al.*, 2011).

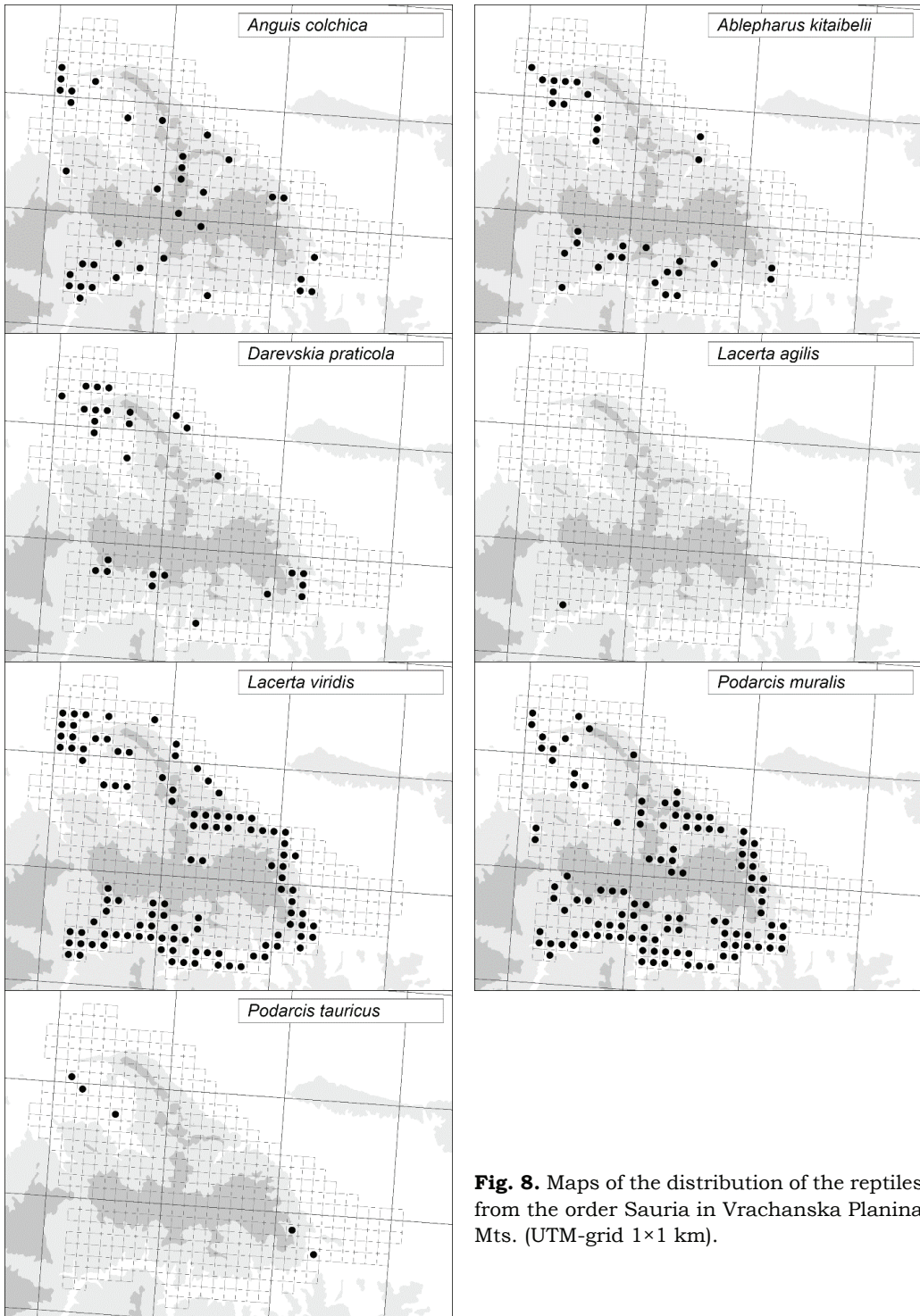


Fig. 8. Maps of the distribution of the reptiles from the order Sauria in Vrachanska Planina Mts. (UTM-grid 1×1 km).

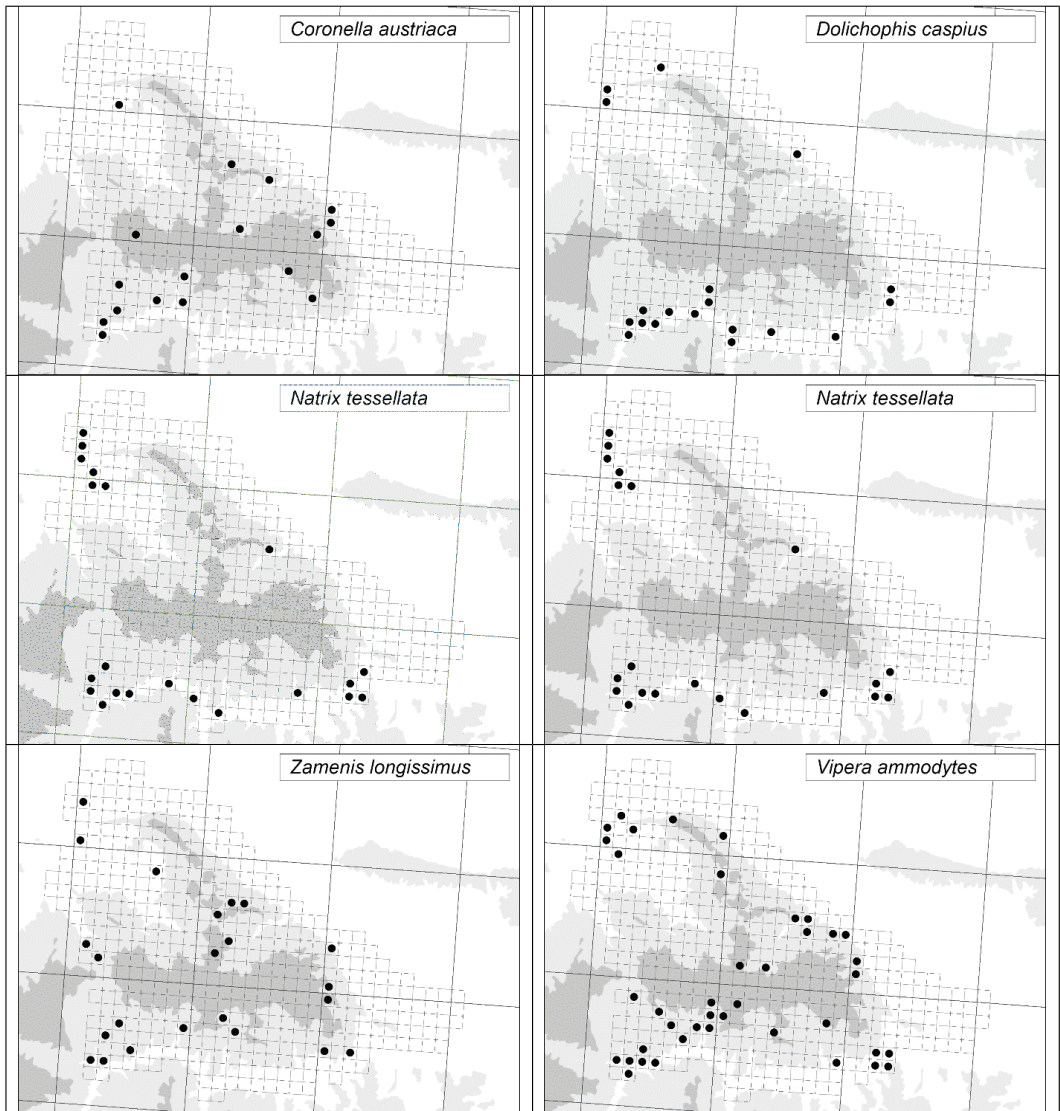


Fig. 9. Maps of the distribution of the reptiles from the order Serpentes in Vrachanska Planina Mts. (UTM-grid 1×1 km).

The other four snake species - *Vipera ammodytes*, *Zamenis longissimus*, *Natrix natrix* and *Coronella austriaca* are observed sporadically in almost the entire territory of the Vrachanska Planina Mts. All four species are widespread in Bulgaria from sea level up to over 1500 m a.s.l. (see Stojanov *et al.* 2011). Widest altitude range covering almost entirely that of the study area, was registered for *V. ammodytes* and *N. natrix* (Fig. 4). From the two subspecies of *V. ammodytes*, occurring in Bulgaria, in the Vrachanska Planina Mts. only *V. a. ammodytes* is found, which corresponds to the perception of the distribution ranges of the two taxa (see Stojanov *et al.* 2011). The location east of the Parshevitsa Peak (UTM: GN0718; 1450 m a.s.l.), reported by Beškov *et al.* (1961) is the highest known for *V. a. ammodytes* in the country. The closest known locality of the other subspecies - *V. a. montandoni* Boulenger 1904, is located approximately 20 km to the east, near the Hubavene Village (unpublished data N. Tsankov).

Species richness

Regarding the number of species, the one-kilometer UTM squares, which fall into the territory of Vrachanska Planina Mts. are grouped in four categories, separately for amphibians and reptiles (Fig. 10). The largest number of species (7 amphibian and 10 reptile species) was recorded in square FN9902 (northeast of Stoyanovo Village).

The maximum number of amphibian species was 8, recorded in squares GN0709 and GN0815. The spatial distribution of the squares with the largest number of amphibian species (7 or 8 species) corresponds largely to the positions of the standing water basins: FN9902 – micro dam under the spring of Matnitsa River; GN0815 – two small, shallow basins, south from Peshka Peak; GN0709 – the three basins between Parshevitsa Peak and Beglichka Mogila Peak; GN0794 – small swamp, near the left bank of Iskar River, northeast of Zverino Village. In 3 of the 8 squares, where 5 or 6 species are recorded, there are also standing water basins: FN9913 – swampy floods of Matnitsa River; GN0814 – part of a water basin under Peshka Peak; GN1704 – shallow swamp on the left bank of Iskar River, northeast of Zverino Village (near the mentioned above GN0794). In the rest of the squares from the same category there are no standing water basins, but there are constantly flowing rivers and streams. It should be noted that the registered high species richness is probably due not only to the presence of suitable habitats (wetlands), but also due to the fact that these squares are situated on the most visited by us parts of the mountain. For example the other existing standing water basins (except for the mentioned above) in the area (the dam lake south of Glavatsi Village – FN9924 and FN9934; the basin northeast of Milanovo Village – FN9768 and FN9769; and the water basin, northeast of Beglichka Mogila Peak – GN0729) are less visited and the number of the recorded amphibians there does not exceed three species.

The maximum number of reptile species in single square is 10 (FN9902). A clustering of squares with 5 or more recorded species is notable at the area of Gara Laktnik Village, Opletnya Village and Milanovo Village (UTM 10x10 km square - FN97), in the area of Stoyanovo Village and Dolno Orizovo Village (FN99), as well as the area north of Cherepish Train station (GN17). Large number of species are recorded also in the Vratsata Area (GN0855). All mentioned regions are characterized with relatively low altitude and diverse micro relief and land cover, which by itself is a prerequisite for the existence of large number of reptiles. On the other hand these areas are situated in the most visited by us parts of the mountain, so similar species richness may be expected in other squares as well, with similar conditions, which are not well researched yet. The highest central part of the mountain seems considerably poor in reptiles – for example in the areas of Beglichka Mogila Peak and Parshevitsa Peak (GN0709) only one reptile species was recorded, regardless the fact that these areas are visited multiple times.

Conservation

The conservation status of the registered amphibians and reptiles in Vrachanska Planina Mts. is presented in Annex 2. Twenty three species are strictly protected by at least one of the three active laws and conventions for protecting biodiversity: The Biodiversity Act (BA), Council Directive 92/43/EEC (Directive 92/43) and the Bern Convention. With the highest level of protection (Annex II of BA and Annex II of Directive 92/43) are *Triturus cristatus*, *T. ivanbureschi*, *Bombina variegata*, *Emys orbicularis*, *Testudo graeca* and *T. hermanni*. Three of these species (*T. cristatus*, *T. graeca* and *T. hermanni*) are included in

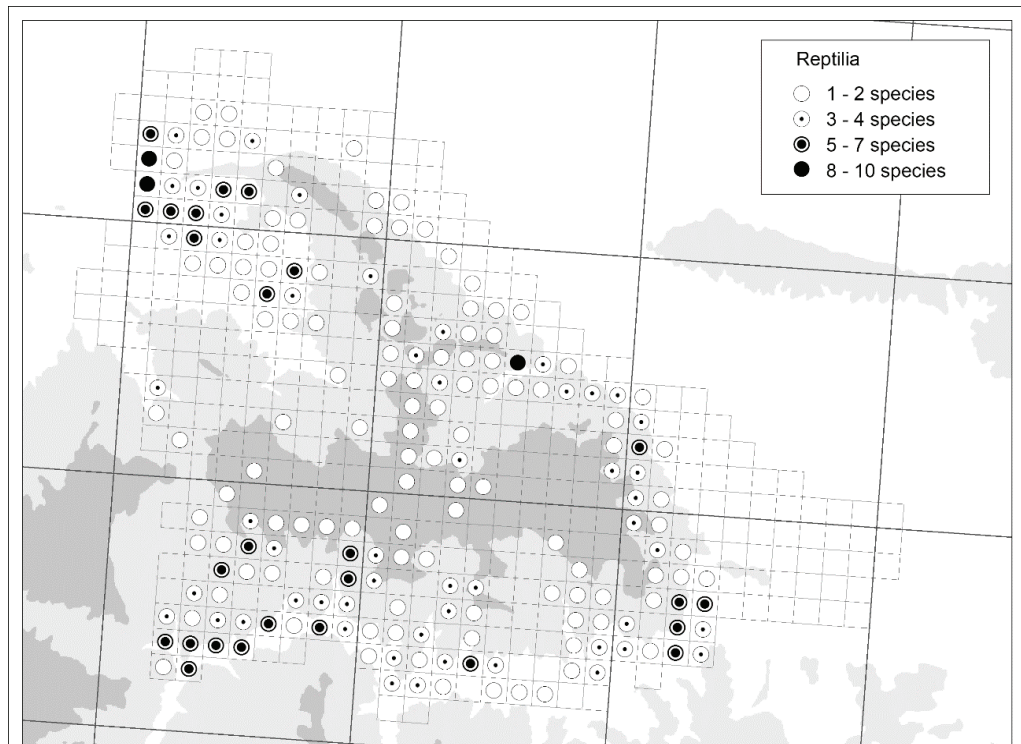
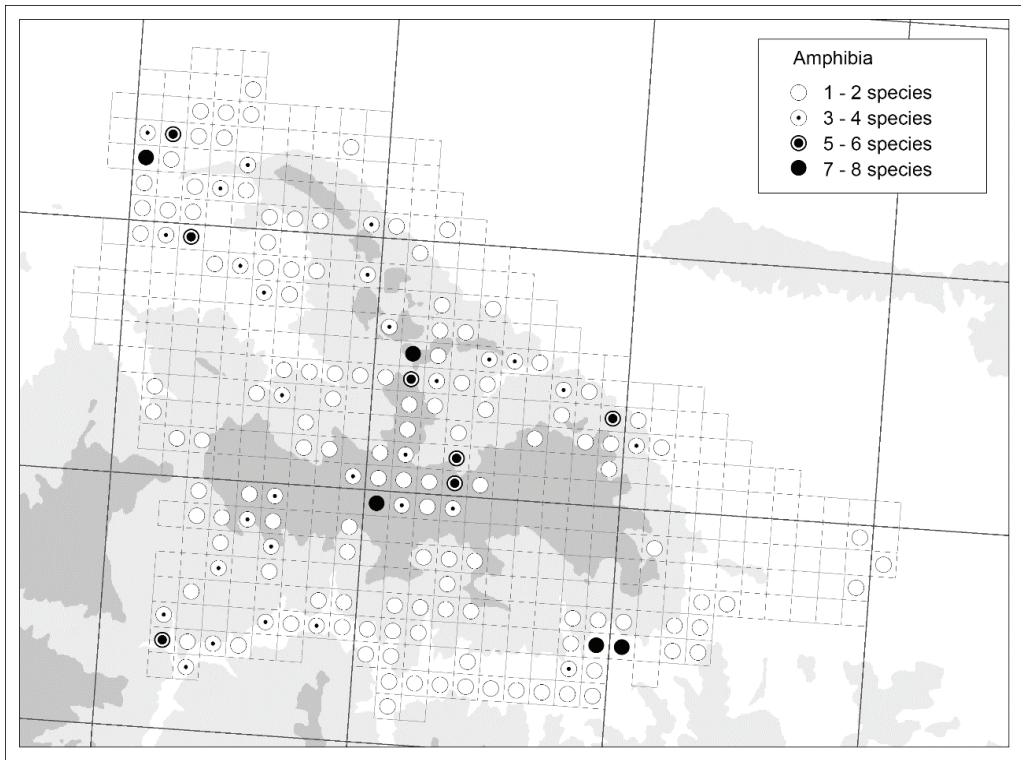


Fig. 10. Herpetofaunal species richness in Vrachanska Planina Mts. (UTM-grid 1×1 km).

the Red Data Book of Bulgaria (Golemanski *et al.* 2015), and *T. graeca* is categorized as „Vulnerable“ in the Red List of IUCN.

Real protection of the species in the study area may be expected only in the territories in which there is active protection (patrolling guard) - Nature Park "Vrachanski Balkan" (occupying about 71% of the area of the mountain) and reserve "Vrachanski Karst" (about 3% of the area of the mountain). Most of the territory of Vrachanska Planina Mts. falls within the four protected zones for the habitats of the Natura 2000 network (around 83% of the area of the mountain). The ratio of the number of locations within the park, reserves and protected areas Natura 2000, and the total number of locations of the amphibian and reptile species registered in Vrachanska Planina Mts. is shown in Fig. 11. 1029 locations of 25 species (about 72 % of all analyzed locations) fall within the parks boundaries. Two species, found in Vrachanska Planina Mts. - *Lacerta agilis* and *Emys orbicularis*, have not been proven to be present in the park. The first species is known for the mountain with only one specimen and the nature of its distribution in the region is unknown. The localities of the second species are located close to the borders of the park, but not in the park itself (there is one known locality without exact coordinates, which may arbitrarily be referred to the park – Iskar River, near Opletnya Village). On the territory of the reserve 13 species have been identified, which is about 48% of the species known from the mountain. The number of locations in the reserve is small - about 6% of all analyzed locations, due to the relatively small area. The protected zones of the Natura 2000 network cover most of the locations of all identified in Vrachanska Planina Mts. species (between 69 and 100% of the locations of individual species; totally about 92% of all analyzed locations).

Regarding the amphibians in general, all one-kilometer UTM squares, in which five or more species are recorded (12 squares) fall within the boundaries of protected zones of Natura 2000, and 9 of them are wholly or partly situated in the limits of the nature park. In regards of the reptiles - also almost all the squares in which 5 or more species have been registered fall within the limits of the protected zones (27 of the 28 such squares), and 24 of these squares fall wholly or partly in the park - one of them falls in the reserve.

During the field studies in Vrachanska Planina Mts. in the recent years we registered some potential threats to amphibians and reptiles. The most significant among them can be defined as follows:

1) Drying-up of the water basins. In 2012, it was found that the little morass, northeast of Zverino Village (UTM: GN0794) is spattered with dirt as a result of the afforestation of the terrace of Iskar River in this region (in the vicinity of the area there is placed sign, announcing this activity). The swamp is one of the places with the highest diversity of amphibians in Vrachanska Planina Mts. Other two ponds located in the highest part of the mountain about 1 km north of Parshevitsa Peak (UTM: FN9890) are dried up for at least 15 years.

2) Fires. In the vicinity of the villages Gorno Ozirovo and Dolno Ozirovo were observed numerous traces of fires. In this area are located most of the known localities of *Testudo hermanni*, which (together with *T. graeca*) is highly vulnerable to fires (Popgeorgiev & Kornilev 2009).

3) Road mortality. Trampled amphibians and reptiles were found on the road between Gara Lakatnik Village and Lyutibrod Village (4 species); between Gara Lakatnik Village and Gorno Pole Village (4 species); between Ledenika Cave and Parshevitsa Hut (3 species); between Lyutibrod Village and Chelopek Village (1 species) and between Vratsa Town

and Zgorigrad Village (1 species). The recorded dead specimens belong to three species of amphibians (*Salamandra salamandra*, *Bufo bufo* and *Bufo viridis* complex) and 6 species of reptiles (*Anguis colchica*, *Dolichophis caspius*, *Natrix natrix*, *N. tessellata*, *Zamenis longissimus* and *Vipera ammodytes*).

It should be noted that in this study the threats were not subject of the field studies, therefore their real significance remains unknown. We recommend that in the preparation of the management plans for the nature park and the protected zones, there should be planned and conducted targeted studies that would justify the conservational problems and threats and concrete measures should be taken to eliminate or mitigate them.

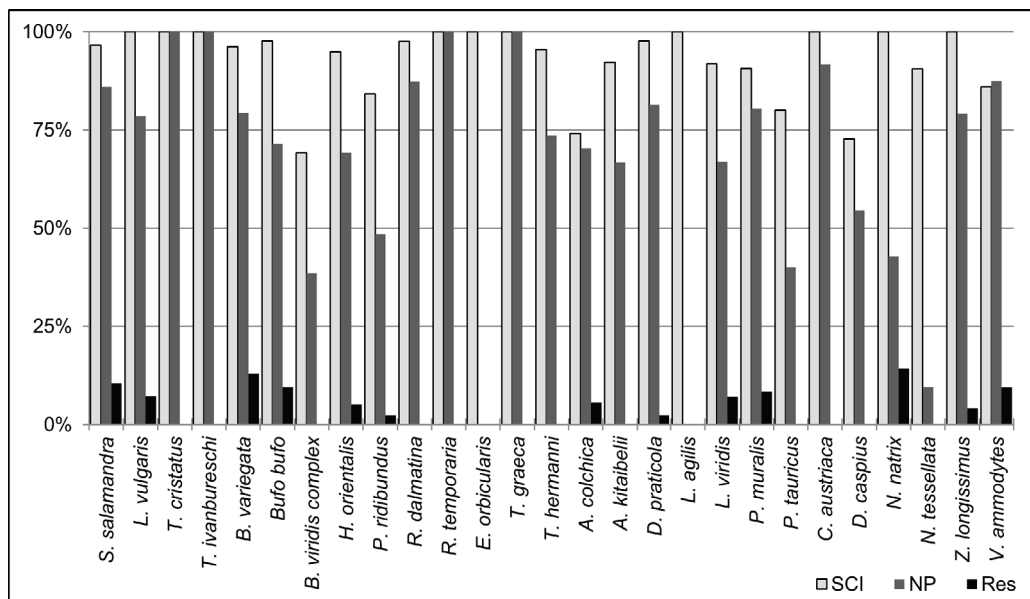


Fig. 11. Percentage ratio of the number of locations in the protected zones (SCI), the nature park (NP) and the reserve (Res), and the total number of locations of amphibians and reptiles in Vrachanska Planina Mts. (n = 1430).

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Appendix 1

Number of localities and UTM-quadrats, in which they occur.

Species	LoccN	LoccP+N	LoccP	LoccT	UTM
<i>Salamandra salamandra</i>	51	0	0	51	38
<i>Lissotriton vulgaris</i>	11	3	0	14	12
<i>Triturus cristatus</i>	4	2	3	9	4
<i>Triturus ivanbureschi</i>	2	0	0	2	2
<i>Bombina variegata</i>	124	0	2	126	73
<i>Bufo bufo</i>	39	0	1	40	31
<i>Bufo viridis</i> complex	11	0	1	12	11
<i>Hyla arborea</i>	34	1	0	35	23
<i>Pelophylax ridibundus</i>	116	1	0	117	80
<i>Rana dalmatina</i>	65	1	0	66	50
<i>Rana temporaria</i>	17	0	0	17	11
<i>Emys orbicularis</i>	10	0	0	10	10
<i>Testudo graeca</i>	2	0	1	3	3
<i>Testudo hermanni</i>	64	0	0	64	32
<i>Ablepharus kitaibelii</i>	40	0	2	42	36
<i>Anguis colchica</i>	50	0	2	52	32
<i>Darevskia praticola</i>	39	0	1	40	27
<i>Lacerta agilis</i>	1	0	0	1	1
<i>Lacerta viridis</i>	156	0	0	156	107
<i>Podarcis muralis</i>	228	0	1	229	113
<i>Podarcis tauricus</i>	5	0	0	5	5
<i>Coronella austriaca</i>	17	0	3	20	17
<i>Dolichophis caspius</i>	22	0	1	23	19
<i>Natrix natrix</i>	27	0	1	28	22
<i>Natrix tessellata</i>	17	0	4	21	21
<i>Zamenis longissimus</i>	24	0	1	25	23
<i>Vipera ammodytes</i>	60	0	8	68	40

Legend:

LoccN – number of localities, based only on new (unpublished) data; LoccP+N – number of localities, based on published and new data; LoccP – number of localities, based only on published data; LoccT – total number of known localities; UTM – number of 1x1 UTM-squares, in which the localities occur (based on the total number of known localities).

Appendix 2

Conservation status of the species and their presence/absence in nature park “Vrachanski Balkan”, reserve “Vrachaski Karst” and the protected zones from the Natura 2000 network.

Species	BDA	Dir	BC	RDB	IUCN	NP	RE	SCI
<i>Salamandra salamandra</i>	III	-	II	-	LC	+	+	+
<i>Lissotriton vulgaris</i>	III	-	II	-	LC	+	+	+
<i>Triturus cristatus</i>	II, III	II, IV	II	VU	LC	+	-	+
<i>Triturus ivanbureschi</i>	II, III	II, IV	II	-	LC	+	-	+
<i>Bombina variegata</i>	II, III	II, IV	II	-	LC	+	+	+
<i>Bufo bufo</i>	III	-	II	-	LC	+	+	+
<i>Bufotes viridis</i> complex	III	-	II	-	LC	+	-	+
<i>Hyla orientalis</i>	III	IV	II	-	LC	+	+	+
<i>Pelophylax ridibundus</i>	IV	IV	II	-	LC	+	+	+
<i>Rana dalmatina</i>	-	IV	II	-	LC	+	-	+
<i>Rana temporaria</i>	IV	IV	II	-	LC	+	-	+
<i>Emys orbicularis</i>	II, III	II, IV	II	-	NT	-	-	+
<i>Testudo graeca</i>	II, III	II, IV	II	EN	VU	+	-	+
<i>Testudo hermanni</i>	II, III	II, IV	II	EN	NT	+	-	+
<i>Anguis colchica</i>	III	-	II	-	-	+	+	+
<i>Ablepharus kitaibelii</i>	III	IV	II	-	LC	+	-	+
<i>Darevskia praticola</i>	-	IV	II	-	NT	+	+	+
<i>Lacerta agilis</i>	III	IV	II	-	-	-	-	+
<i>Lacerta viridis</i>	III	IV	II	-	LC	+	+	+
<i>Podarcis muralis</i>	III	IV	II	-	LC	+	+	+
<i>Podarcis tauricus</i>	III	IV	II	-	LC	+	-	+
<i>Coronella austriaca</i>	III	IV	II	-	-	+	-	+
<i>Dolichophis caspius</i>	III	IV	II	-	-	+	-	+
<i>Natrix natrix</i>	-	IV	II	-	LC	+	+	+
<i>Natrix tessellata</i>	III	IV	II	-	LC	+	-	+
<i>Zamenis longissimus</i>	III	IV	II	-	LC	+	+	+
<i>Vipera ammodytes</i>	III	IV	II	-	LC	+	+	+

Legend:

BDA – appendix number in the Biological Diversity Act of Bulgaria (accessible on-line at <http://www.moew.government.bg/?show=top&cid=227&lang=en>); Dir – appendix number in the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (accessible on-line at <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:01992L0043-20070101>); BC – appendix number in the Convention on the Conservation of European Wildlife and Natural Habitats, Bern, 19.IX.1979 (accessible on-line at <http://conventions.coe.int/Treaty/en/Treaties/Html/104.htm>); RDB – abbreviation of the category in the Red Data Book of Bulgaria (accessible on-line at <http://e-ecodb.bas.bg/rdb/en/vol2/>); IUCN – abbreviation of the category in the IUCN Red List of Threatened Species (accessible on-line at <http://www.iucnredlist.org/>); NP – Natural park “Vrachanski Balkan”; RE – Reserve “Vrachanski Karst”; SCI – Sites of Community Importance (Natura 2000 network).

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Херпетофауната (Amphibia & Reptilia) на Врачанска Планина – Видов състав, разпространение и опазване

БОРИСЛАВ НАУМОВ, НИКОЛАЙ ЦАНКОВ, КРАСИМИР
ДОНЧЕВ, БОЯН ПЕТРОВ, АНДРЕЙ СТОЯНОВ, ГЕОРГИ
ПОПГЕОРГИЕВ, ИВЕЛИН МОЛЛОВ,
ВЛАДИМИР БЕШКОВ

(Резюме)

Врачанска планина се намира в Северозападна България и представлява сравнително добре обособен дял от Стара планина. Досега не са публикувани цялостни проучвания върху видовия състав и разпространението на херпетофауната на Врачанска планина.

В резултат на настоящата работа са установени 8 нови за планината земноводни и влечуги, и са потвърдени вече известните 19 вида. Находищата на отделните видове са картирани в УТМ-мрежа с резолюция 1 × 1 km. Направен е анализ на хоризонталното и вертикалното разпространение, както и на видовото богатство. Коментирано е значението на съществуващите във Врачанска планина защитени територии и защитени зони от мрежата Натура 2000 за опазването на херпетофауната. Посочени са някои потенциални заплахи за земноводните и влечугите в изследвания район – пресъхване на водоеми, пожари и смъртност по пътищата.