4. AMPHIBIANS AND REPTILES OF BULGARIA: FAUNA, VERTICAL DISTRIBUTION, ZOOGEOGRAPHY, AND CONSERVATION

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Abstract. The geographical position, mild climate, mountainous landscape, and habitat heterogeneity determine Bulgaria's rich diversity of herpetofauna. Currently, 17 species of amphibians (20 subspecies) and 36 species of reptiles (45 subspecies) are known from Bulgaria. Due to its transitional position, Bulgaria lies at the southern or northern distribution limits of many species of amphibians and reptiles. Vertical distribution is presented for all species found in Bulgaria. The richest in terms of diversity and abundance are the areas below 400 m, where nearly 95 % of taxa occur. The geographical ranges of almost all amphibians and reptiles in Bulgaria are well-known, although on a local scale the information is often limited. Zoogeographical analysis demonstrates that amphibian species belong to nine chorotypes, of which the Eastern Mediterranean and the European chorotypes are represented with three species each. Out of the ten chorotypes recognized for the reptiles, 51.4 % of the species belong to the Eastern Mediterranean (25.7 %) and Turanian–Mediterranean (25.7 %) chorotypes. Only two subspecies are Bulgarian endemics (*Salamandra salamandra beschkovi* and *Mediodactylus kotschyi rumelicus*). Due to the high diversity and mosaic distribution of habitats in Bulgaria, the herpetofauna has a rather continuous occurrence and high relative abundance. Although 80 % of the Bulgarian herpetofauna is legally protected by the Biodiversity Protection Act (2002) and other conventions, some species are threatened through collection for trade or habitat changes due to construction. Several sites in the southern part of Bulgaria are very rich in herpetofauna (nine to ten species of amphibians and 19 to 21 species of reptiles).

1 Introduction

Bulgaria is situated in the center of the eastern part of the Balkan Peninsula. Compared to other Balkan countries, Bulgaria has a relatively large territory, 110,993 km^2. The relief is very diverse starting from the sea level (Black Sea coast), through the hilly landscape to low and high mountains up to 2925 m high (Musala Peak in Rila Mts.). The territories below 200 m occupy 31.4 % of Bulgaria; between 200 m and 600 m, 41%; between 600 and 1000 m, 15.5 %; between 1000 and 1600 m, 9.8 %; the mountains above 1600 m occupy only 2.5 %. Stara Planina Mts. (the Balkan Range) divide Bulgaria into southern and northern parts. This partition directly influences the climate rather than the species composition and distribution of the herpetofauna (Beshkov, 1984b). Three main types of climate are characteristic for Bulgaria: continental (in the northernmost part of the country), transitional-continental (in the central part), and Submediterranean (in the south and along the Black Sea coast). All these environmental factors determine Bulgaria's rich biodiversity, including a diverse and abundant herpetofauna.

2 Brief History of the Herpetological Research in Bulgaria

Herpetological research in Bulgaria started relatively late, at the end of the 19th century when Hristovich (1892) published brief records for the amphibians and reptiles encountered during his natural surveys. New species and localities were published from time to time in the beginning of the 20th century. The first attempt to summarize the herpetological diversity of Bulgaria was by Kovachev (1912) who reported 13 species of amphibians and 26 species of reptiles. Two years later, Chichkoff (1914) found and published *Triturus alpestris* and *Typhlops vermicularis* as new species for the Bulgarian fauna. The most comprehensive data for the distribution of amphibians and reptiles in Bulgaria, and in the entire Balkan Peninsula, were published by Buresch and Zonkow (1933, 1934, 1941, 1942). These works became the foundation of the current herpetological knowledge for this region of Europe. In the next 50 years, the records of *Telescopus fallax*, *Rana esculenta* (Beshkov, 1959, 1965), and *Platyceps collaris* (= *Coluber rubriceps*) (Bartošik and Beshkov, 1979) were published as new for Bulgaria. Meanwhile, V. Beshkov, the most active Bulgarian herpetologist, published many papers on distribution, taxonomy, ecology, and conservation of the Bulgarian amphibians and reptiles. The most important contributions dealing with the Bulgarian herpetofauna are those by Beškov and Beron (1964) and Beshkov and Nanev (2002). Distribution and ecology of some species were studied in detail: *Salamandra salamandra* (Beshkov and Tsonchev, 1963), *Rana graeca* (Beshkov, 1970a, 1970b, 1972b), *R. temporaria* (Beshkov and Angelova, 1981), *Bombina variegata* (Beshkov and Jameson, 1980), land tortoises *Testudo* spp. (Beshkov, 1984a, 1993, 1997), *Anguis fragilis* (Beshkov, 1966), *Zamenis longissimus* (Beshkov, 1975, 1976), *Vipera ursinii* (Beshkov, 1973), *V. aspis* (Buresch and Beškov, 1965), and *V. ammodytes* (Beshkov, 1977; Christov and Beshkov, 1999).

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In the recent years, herpetologists studied the composition and distribution of the herpetofauna in some regions along the southern border of Bulgaria (Stoev, 2000; Petrov et al., 2001; Tzankov, 2003). Other current contributions reported some rare species from previously unknown localities (e.g. *Telescopus fallax* from the Eastern Rhodopes; Petrov et al., 2002) or confirmed the presence of species considered extinct in Bulgaria (e.g. *Vipera ursinii*; Hristov et al., 2004).

The majority of the papers on the Bulgarian herpetofauna were published by local herpetologists. However, many researchers from other countries also participated in the herpetological research on certain species. They studied taxonomic aspects, e.g. for *Triturus vulgaris graecus* (Obst and Geissler, 1982), *Ophisaurus apodus thracius* (Obst, 1978), *Mediodactylus kotschyi* (Rösler, 1999), *Platyceps collaris (= Coluber rubriceps) thracius* (Rehák, 1985); distribution (e.g. Cyrén, 1933, 1941; Geissler and Bruhl, 1980; Chlebicki, 1985; Noellert and Ritter, 1986a, 1986b), or ecology, e.g. of *Lacerta trilineata* (Peters, 1962, 1963) and *L. vivipara* (Guillaume et al., 1997).

3 Species Composition and Distribution

Bulgaria is inhabited by 17 species of amphibians (five species of tailed amphibians and 12 species of anurans) and 36 species of reptiles (four species of turtles, two species of tortoises, 13 species of lizards, and 17 species of snakes). At the subspecific level, amphibians are represented by 20 recognized subspecies (Table 1), and reptiles, by 45 subspecies (Table 2). While no amphibians became recently extinct in Bulgaria, some species of reptiles have not been found in this country for a long time. Two species of sea turtles (*Caretta caretta* and *Chelonia mydas*) are very rarely found at the Black Sea coast and thus are considered vagrant, non-native species. There is no contemporary field record of *Vipera aspis balcanica*, which was found in 1933 close to Harmanli, in the Bulgarian Eastern Rhodopes (Buresch and Zonkow, 1934). Its occurrence and systematic position were discussed by Buresch and Beškov (1965) who concluded that this snake could be considered extinct in Bulgaria.

3.1 AMPHIBIANS

Among the tailed amphibians, the most common within the aquatic habitats of Bulgaria are *Triturus vulgaris* and *T. karelinii*. The sister species of the latter, *T. dobrogicus* is known only along Danube. *Triturus vulgaris graecus* was found only in the southern parts of the Struma Valley (southwestern Bulgaria). *Salamandra salamandra beschkovi* is known only from its type locality. The nominate subspecies of the fire salamander is common in the hilly and mountainous regions but has not been found in the vast parts of the Danubian Plain and Thracian Lowland, along the Black Sea coast, and in Strandja Mts. *Triturus alpestris* and *Rana temporaria* occur only in the mountains. Species of *Bombina* very rarely occur sympatrically: *B. variegata* is very common in the hilly and mountainous areas, while *B. bombina* occurs only along rivers and wetlands in the plains and along the sea coast. The most widespread and abundant anurans in Bulgaria are *Rana ridibunda*, *R. dalmatina*, *Bufo viridis*, *B. bufo*, and *Hyla arborea*. Distribution of *Rana graeca* is restricted to the western and southern border mountains reaching the Eastern Rhodopes to the east. *R. esculenta* is found only at several sites along Danube but further research is needed to clarify its distribution. *Pelobates fuscus* is rarely found in the Danubian Plain and Sofia Basin. *P. syriacus* occurs in southwestern Bulgaria (south of Kresna), Thracian Lowland along Maritsa River, Strandja Mts., Black Sea coast, and in scattered localities along Danube. In conclusion, distribution of most amphibian species in Bulgaria is relatively well known. Detailed data are lacking for the distribution of *Bufo bufo spinosus*, *Rana esculenta*, *Triturus karelinii*, *T. vulgaris vulgaris*, *T. vulgaris graecus*, and *Salamandra salamandra beschkovi.*

3.2 REPTILES

Among turtles, *Emys orbicularis* is a common species in the lowlands of Bulgaria, and rarely is found above 1000 m. *Mauremys rivulata* occurs only in the southernmost parts of the country (southwestern Bulgaria, Eastern Rhodopes, Sakar Mts., Strandja Mts., and along the Black Sea coast south of Tsarevo). Both species of tortoises (*Testudo* spp.) occur mainly in the lowlands. A recent survey in the Eastern Rhodopes revealed that tortoises are still common in about one-third of the mountain territory due to the high variety and mosaic distribution of suitable habitats (Petrov, 2004). This region is therefore known to shelter the richest and most compact population of both tortoise species in Bulgaria (Petrov et al., 2004). It is worth mentioning that the record-sized *Testudo*

graeca (carapace length, 389 mm; weight, 5.86–7 kg) and *T. hermanni* (carapace length, ca. 357 mm) known to date were found in Bulgaria (Beshkov, 1997).

[INSERT FIG. 1 and FIG. 2]

Several species of lizards have scattered distribution and relatively low population densities, e.g. *Ablepharus kitaibelii* and *Darevskia praticola*, or inhabit disjunct ranges, e.g. *Ophisaurus apodus*, *Ophisops elegans* (Fig. 1), and *Lacerta vivipara*. The most common and widespread snakes in Bulgaria are *Natrix natrix* and *Dolichophis caspius*. Restricted ranges are known for *Platyceps collaris* (southern Bulgarian Black Sea coast, Fig. 2), *Vipera ursinii* (northeastern Bulgaria), *Elaphe quatuorlineata quatuorlineata* (southwestern Bulgaria, south of Kresna Gorge), and *E. quatuorlineata sauromates* (scattered in the eastern part of the country). *Zamenis longissimus* is known to occur in many localities but it is considered threatened by habitat changes. Due to its aggressive behavior and adaptability, *Malpolon monspessulanus* has notably increased its population density and probably its range, though it is restricted only to the south of the country (Beshkov, 1998).

Distribution of the majority of species is not limited by specific ecological constraints. Only few species require special types of habitats. The gecko *Mediodactylus kotschyi* occurs in Bulgaria almost entirely in human settlements. Microclimatic features are considered to confine its distribution. This species was found in the wild only in two places, in the rocks along the southern Black Sea coast. Occurrence of *Typhlops vermicularis* and *Eryx jaculus* within their small ranges is limited by the presence of dry and sandy soils. *Telescopus fallax* was mainly found only in the areas with screes and numerous rocks, and rarely in the sandstone terrain. The geographical ranges of most reptiles in Bulgaria are well known. However, almost no data are available for the local distribution of the rare and endangered species (e.g. *Ophisaurus apodus*, *Eryx jaculus*, *Elaphe quatuorlineata quatuorlineata*, *Zamenis situla*, *Vipera ursinii*). Regional abundance and population ecology of the latter species are poorly studied. National and local quantitative assessments were conducted in the past only for some species (e.g. *Mauremys rivulata*, *Testudo* spp.). Large areas in the Danubian Plain, Dobrudja, Eastern Stara Planina, Thracian Lowland, and the border mountain ranges Slavyanka and Belasitsa are inadequately studied.

Diversity of the habitats in Bulgaria is extremely high, and the distribution of herpetofauna within the landscapes is highly mosaic. Such a mosaic habitat pattern is among the basic factors determining a rather continuous distribution of the herpetofauna in Bulgaria. Some of the geographical districts have low herpetological diversity and population densities due to intensive agriculture, habitat fragmentation, or development of large open mining areas (e.g. in parts of the Upper Thracian Lowland and Dobrudja).

There are no introduced species of amphibians and reptiles in Bulgaria, which would have become widespread or locally adapted. At present, this could be explained by the weakly developed market of terrarium-held herpetospecies and a generally negative attitude towards these groups as pet animals. However, introduction of native species in the areas or altitudes where they do not naturally occur is known (e.g. release of homebred *Testudo* spp. in the mountains above 1500 m). With few exceptions of species that still could be found (e.g. *Rana balcanica* in southwestern Bulgaria, *Eremias arguta* in Bulgarian Dobrudja, *Vipera xanthina* in Bulgarian Thrace), no other species of amphibians and reptiles are expected to be discovered in Bulgaria.

4 Altitudinal Distribution

Vertical distribution of the amphibians and reptiles in Bulgaria has never been summarized in detail. Beškov and Beron (1964) outlined the basic data known by that time. Few regional attempts revealed some patterns at a local scale (e.g. Beshkov, 1974; Beshkov and Stoyanov, 2000). Beshkov (1989) presented brief data on the occurrence of some species in the mountains. The most recent descriptive review was done by Beshkov and Nanev (2002).

Tables 1 and 2 show distribution and relative abundance of all species and subspecies found in Bulgaria. Distribution is presented along 14 (Amphibia) and 15 (Reptilia) 200 m altitudinal belts. The species are sorted according to their abundance within these belts. Abundance is relative for each belt and is based upon the field records published in the literature. The systematic arrangement follows Arnold and Ovenden (2002). Question marks indicate presumable distribution. Zeros indicate absence of the taxon from a given altitudinal belt. High altitude occurrence of some taxa (e.g. *Rana dalmatina*, *Lacerta agilis*, *Darevskia praticola*, *Ablepharus kitaibelii*) is based on the unpublished records of Vladimir Beshkov and Nikolay Tzankov.

[INSERT TABLE 1]

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4.1 AMPHIBIANS (Table 1)

The regions below 200 m are the richest in species and their abundance (18 taxa, 15 species). Five taxa, *Triturus vulgaris graecus*, *T. dobrogicus*, *Rana* kl. *esculenta*, *Pelobates syriacus*, and *Bombina bombina*, are known to occur only below 400 m. Eight taxa (40 %) do not climb higher than 600 m. Up to 1200 m, ten species are still abundant and common. Five species are common between 1200 m and 1400 m, and only two, above 1600 m. Species reaching the highest altitudes are *Triturus alpestris* (2500 m) and *Rana temporaria* (ca. 2500 m), which are considered glacial relicts in the fauna of Bulgaria. Unusual vertical breeding migration from 1400 m down to 360 m and back was recorded for *Rana temporaria* (Beshkov and Angelova, 1981). Findings of *Salamandra salamandra salamandra* and *Bufo bufo* above 2000 m are occasional, and accidental for *Hyla arborea* and *Bufo viridis* at 2300 m. *Salamandra salamandra salamandra*, *Bufo bufo bufo*, *Bombina variegata*, and *Rana temporaria* have the greatest vertical tolerance and occur in 11 belts, i.e. within a range of 2200 m. *Bombina variegata* and *Rana ridibunda* are the only two species which can be found in sympatry with all other anurans recorded in Bulgaria (Beshkov, 1972a).

4.2 REPTILES (Table 2)

Beshkov (1974) assessed diversity of snakes in a region located in southwestern Bulgaria between the altitudes of 180 m and 600 m where he has found 11 species. High diversity of six lacertid lizard species was observed in a marginal area of the Thracian Lowland (village Mezek) between 180 m and 500 m (Tzankov, 2003).

In general, abundance of the species (e.g. *Mediodactylus kotschyi*, *Ophisops elegans*, *Typhlops vermicularis*) for which Bulgaria lies in the northern border of their European distribution is higher below 400 m of altitude. The species belonging to the Turanian–Mediterranean chorotype complex live in the lowest, warmest parts of the country, and only some occasionally reach 1000–1400 m. While the species of the Mediterranean complex (*Eryx jaculus* and *Malpolon monspessulanus*) occur strictly below 500 m, most of the species of the South European chorotype complex (*Testudo hermanni*, *Lacerta viridis*, *Podarcis muralis*, and *Zamenis longissimus*) have considerably greater altitudinal range (0 to 1400–2000 m).

[INSERT TABLE 2]

The species diversity of the reptiles in Bulgaria is the greatest below 400 m where nearly 95 % of the taxa occur (sea turtles are not considered). *Platyceps collaris*, *Mauremys rivulata*, *Mediodactylus kotschyi rumelicus*, *M. kotschyi danilevskii*, *Typhlops vermicularis*, and *Eryx jaculus* have never been found above 400 m. Species richness and abundance between 400 m and 600 m is still very high (22 taxa). Slight decrease in the abundance of reptiles is visible between 800 m and 1000 m where only eight taxa have rich populations. The reptiles have low abundance above 1400 m (only four taxa are common at these altitudes). The poorest region in terms of the species richness and abundance are the mountains above 2000 m, where only *Vipera berus*, *Lacerta agilis bosnica*, *Podarcis muralis muralis* (occasional), and *Lacerta vivipara* occur. The latter is the species which reaches the highest altitude in Bulgaria (2900 m). The most widely occurring taxa are *P. muralis muralis* and *L. vivipara* which are found in 11 altitudinal belts (i.e. in the range of 2200 m).

5 Zoogeographical Analysis of the Herpetofauna of Bulgaria

There are only a few conflicting attempts to present zoogeographical classification of the Bulgarian herpetofauna. Buresch and Zonkow (1933, 1934, 1941, 1942) provided brief zoogeographical characteristics for each species reported at that time in Bulgaria. Beškov and Beron (1964) have classified all herpetospecies but did not discuss their relations and affinities. Popov (1997) has grouped Bulgarian amphibians and reptiles according to their ecological preferences in two main complexes:

Mesophilous forest fauna. Boreal elements: *Vipera berus*, *Lacerta vivipara*, *Rana temporaria*, *Triturus vulgaris*; Nemoral elements: *Bufo bufo*, *B. viridis*, *Hyla arborea*, *Anguis fragilis*, *Natrix natrix*, *Coronella austriaca*; Steppe elements: *Vipera ursinii*, *Lacerta agilis*; Broad-leaved deciduous forest elements: *Salamandra salamandra*, *Triturus cristatus*, *T. alpestris*, *Pelobates fuscus*, *Bombina bombina*, *B. variegata*; South European elements: *Rana dalmatina, Lacerta viridis*, *Zamenis longissimus*, *Elaphe quatuorlineata*, *Testudo hermanni*; Balkan, Pontian and Southeast European elements: *Darevskia praticola*, *Podarcis taurica*, *Dolichophis caspius*.

Thermoxerophilous forest fauna: *Rana ridibunda*, *R. graeca*, *Pelobates syriacus*, *Mauremys rivulata*, *Emys orbicularis*, *Testudo graeca*, *Mediodactylus kotschyi*, *Podarcis muralis*, *P. erhardii*, *Ablepharus kitaibelii*, *Lacerta trilineata*, *Ophisaurus apodus*, *Zamenis situla*, *Telescopus fallax*, *Malpolon monspessulanus*, *Eryx jaculus*, *Platyceps najadum*, *P. collaris*, *Typhlops vermicularis*, *Natrix tessellata*, *Vipera ammodytes*.

Our present analysis follows the chorotype classification of Vigna Taglianti et al. (1999), which among the other considered groups was based upon the distribution of many Western Palearctic species of amphibians and reptiles. We also considered the approach of Sindaco et al. (2000) who have further clarified and detailed the chorotypes of the reptiles of Anatolia. General distribution of the species is based on the data of Gasc et al. (1997) and Engelmann et al. (1993). Zoogeographical classification of the Bulgarian herpetofauna is presented in Table 3.

5.1 AMPHIBIANS

The Bulgarian amphibians are classified into nine main chorotypes (Table 3). Compared to the species richness of the Bulgarian reptiles, the amphibians belong to greater number of chorotypes considering the total number of species (17 species, i.e. 1.89 species per chorotype). Six species are classified into Eastern Mediterranean and European chorotypes (three species, or 17.6 %, each). Eight species are grouped in four chorotypes (two species, or 11.8 %, each): Turanian–European–Mediterranean, European–Mediterranean, South European, and Central European. Three species belong to Eurosiberian (*Rana temporaria*), Central Asian–European (*Pelobates fuscus*), and Turanian–Mediterranean (*Pelobates syriacus*) chorotypes. Bulgaria and its adjacent border areas with Greece and Turkey are the southernmost limits of the ranges of *Bombina bombina*, *Pelobates fuscus*, and *Rana temporaria*. The frog species *Rana graeca* is endemic to the southern Balkan Peninsula.

[INSERT TABLE 3]

5.2 REPTILES

The Bulgarian reptiles are classified in ten main chorotypes (Table 3). With regard to the total number of species, the chorotype diversity (3.5 species per chorotype) is lower compared to the amphibians. Since only the main chorotypes were taken into account, some species were assigned to a much broader chorotype than they actually inhabit. For instance, *Darevskia praticola* has a Pontian–Caucasian distribution (areas around the Black Sea) and thus the species was placed into the Eastern Mediterranean chorotype. *Podarcis erhardii* was also classified in the latter although it is endemic for the southern part of the Balkan Peninsula (southern Albania, Macedonia, southern Bulgaria, Greece, and Crete). *Lacerta viridis bilineata* (i.e. western populations of *L. viridis*) is considered a subspecies (not as in Sindaco et al., 2000). The analysis does not account for *Vipera aspis* because it is considered extinct in Bulgaria. Both species of sea turtles are included as cosmopolitan species.

Due to the geographic position of Bulgaria, it is not surprising that 51.4 % of the species belong to the Eastern Mediterranean (25.7 %) and Turanian–Mediterranean chorotypes (25.7 %) (Table 3). Most of the species belonging to these chorotypes occur in the Southern zoogeographical region of Bulgaria (including Struma–Mesta, Thracian, Strandja, and Black Sea coast subregions) as defined in the zoogeographical division of Guéorguiev (1997). Being the warmest part of the country, these subregions are the richest in terms of the species richness and abundance of reptiles in Bulgaria. The remaining eight chorotypes are represented by one to four species each (2.9 % to 11.4 %). The only two Eurosiberian species, *Lacerta vivipara* and *Vipera berus*, are common only in the high mountains above 1200 m. The Bulgarian Western Rhodopes are the southernmost point within the range of *Lacerta vivipara*.

The endemic Bulgarian taxa are *Salamandra salamandra beschkovi* Obst, 1981 and *Mediodactylus kotschyi rumelicus* (Müller, 1939). The first was described from the vicinity of Sandanski (southwestern Bulgaria), the second from the town of Plovdiv. Although both taxa are regarded as valid, *S. salamandra beschkovi* is considered a subspecies whose status needs further clarification. *Mediodactylus kotschyi rumelicus* is one of the three known subspecies of the Kotschy's gecko, which are entirely allopatric in Bulgaria. *Ophisaurus apodus thracius* Obst, 1978 and *Platyceps collaris thracius* Rehák, 1985 are Bulgarian subendemics. Both taxa occur also in European Turkey; the first one is found also in Greece, Macedonia, Albania, Montenegro, Croatia, and Bosnia and Herzegovina.

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6 Conservation of the Bulgarian Herpetofauna

Although 80 % of the Bulgarian herpetofauna is legally protected by the 2002 Biodiversity Protection Act (Table 4), some species are severely threatened. Both tortoise species are endangered at the national scale because of the rapid population decline due to collection for consumption and trade (Petrov et al., 2004). The public concern and awareness toward tortoises were raised again in the recent years and this led to confiscation of 200–400 adult individuals annually from poachers and merchants. For many years tortoises were known to be very common all over the country's lowlands and hilly areas (Beshkov, 1984a, 1993). At present most of the populations became isolated and the number of mature individuals tends to be critically low.

Some species of snakes (e.g. *Zamenis situla*, *Eryx jaculus*, *Telescopus fallax*) with restricted distribution in Bulgaria are regularly collected for trade, and some of their populations were hunted to the brink of extinction (e.g. *Zamenis situla* in the vicinity of Sozopol). On the other hand, although listed in the 2003 IUCN Red List of Threatened Animals, *Bombina bombina*, *Hyla arborea*, and *Emys orbicularis* still have high population densities nearly in all their Bulgarian localities. The Red Data Book of Bulgaria is rather old (published in 1985) and its outdated species list is based on surveys made before 1984. A new, revised edition is currently under preparation.

[INSERT TABLE 4]

Amphibians are mostly threatened by loss and fragmentation of proper aquatic habitats. The herpetofauna in general is vulnerable to nearly all kinds of construction activities that alter natural habitats and destroy their microhabitats and breeding sites in particular. The latter is a serious threat along the Black Sea coast where at many places the rapid development of recreation infrastructure led to habitat fragmentation and loss of connectivity between the sites with herpetological importance. Construction of new roads and highways (e.g. in Kresna Gorge, southwestern Bulgaria) without detailed study of their environmental impact could be a serious threat for the herpetofauna, especially in narrow gorges and river valleys with steep slopes.

In Bulgaria, only two sites (Muhalnitsa Swamp and Petrohan Wet Meadow, both in Western Stara Planina) were declared protected because of their importance for the breeding of *Rana temporaria* and *Triturus alpestris*. Several relatively small sites (ca. 3–5 km^2) in the southern half of Bulgaria are known to hold great herpetological richness. The latter is mostly due to the very high habitat heterogeneity and the mosaic distribution of proper microhabitats. In the Kresna Gorge (southwestern Bulgaria), ten species of amphibians and 21 species of reptiles are known (Petrov and Beshkov, 2001). The valley of Byala Reka River in the Eastern Rhodopes is another site where, respectively, nine and 19 species were found (Petrov et al., 2001). The third most important site is Ropotamo–Maslen Nos (Southern Black Sea coast) which is inhabited by nine species of amphibians and 19 species of reptiles (Petrov, in press). Species diversity of these sites is very high not only at the national and Balkan level but on the European scale as well. In order to protect the rich biodiversity, parts of these sites were declared as reserves (Tisata Reserve in Kresna Gorge; Ropotamo Reserve at the Black Sea coast) or protected areas (Meanders of Byala Reka in the Eastern Rhodopes). However, none of these sites was specially designated for protection of vulnerable or endangered amphibian or reptile species. In order to set priorities for further conservation efforts, a List of Important Herpetofaunal Areas in Bulgaria was recently prepared (Petrov, in press).

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FIGURE LEGENDS

Fig. 1. *Ophisops elegans* from Dolno Lukovo, Eastern Rhodopes; the snake-eyed lizard reaches here the northernmost limits of its European distribution.

Fig. 2. *Platyceps collaris* from Primorsko; the red-headed whip-snake is found in Europe only in a very narrow range along the southern Bulgarian and Turkish Black Sea coast.

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Table 1. Bulgarian amphibians: relative abundance and altitudinal distribution.
0, absent; 1, rare; 2, common; 3, occasional; ?, no data. Altitude in meters.

Taxa	*0–200*	*200–400*	*400–600*	*600–800*	*800–1000*	*1000–1200*	*1200–1400*	*1400–1600*	*1600–1800*	*1800–2000*	*2000–2200*	*2200–2400*	*2400–2600*	*2600–2800*
Triturus vulgaris graecus	1	?	?	?	0	0	0	0	0	0	0	0	0	0
Triturus dobrogicus	2	?	0	0	0	0	0	0	0	0	0	0	0	0
Rana kl. *esculenta*	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelobates syriacus balcanicus	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Bombina bombina bombina	2	1	?	0	0	0	0	0	0	0	0	0	0	0
Bufo bufo spinosus	2	2	1	?	0	0	0	0	0	0	0	0	0	0
Pelobates fuscus fuscus	2	2	1	0	0	0	0	0	0	0	0	0	0	0
Salamandra salamandra beschkovi	1	2	2	?	?	?	0	0	0	0	0	0	0	0
Rana graeca	2	2	2	2	2	1	0	0	0	0	0	0	0	0
Triturus vulgaris vulgaris	2	2	2	2	2	2	1	?	0	0	0	0	0	0
Triturus karelinii	2	2	2	2	2	2	1	?	0	0	0	0	0	0
Hyla arborea arborea	2	2	2	2	2	1	1	1	0	0	0	3	0	0
Rana dalmatina dalmatina	2	2	2	2	2	2	1	1	1	0	0	0	0	0
Rana ridibunda	2	2	2	2	2	2	2	1	1	1	0	0	0	0
Bufo viridis viridis	2	2	2	2	2	2	2	1	1	1	0	3	0	0
Salamandra salamandra salamandra	1	1	2	2	2	2	2	2	1	1	3	3	0	0
Bufo bufo bufo	2	2	2	2	2	2	1	1	1	1	3	0	0	0
Bombina variegata scabra	2	2	2	2	2	2	1	1	1	1	1	0	0	0
Rana temporaria temporaria	0	1	0	1	1	1	2	2	2	2	2	2	1	0
Triturus alpestris	0	0	0	0	0	?	2	2	2	2	2	2	1	0

Table 2. Bulgarian reptiles: relative abundance and altitudinal distribution. 0, absent; 1, rare; 2, common; 3, occasional; ?, no data. Altitude in meters.

Taxa	*0–200*	*200–400*	*400–600*	*600–800*	*800–1000*	*1000–1200*	*1200–1400*	*1400–1600*	*1600–1800*	*1800–2000*	*2000–2200*	*2200–2400*	*2400–2600*	*2600–2800*	*2900*
Caretta caretta	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chelonia mydas	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platyceps collaris thracius	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mauremys rivulata	2	?	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediodactylus kotschyi rumelicus	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Typhlops vermicularis	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Eryx jaculus turcicus	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediodactylus kotschyi danilevskii	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediodactylus kotschyi bibroni	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Anguis fragilis colchica	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Ophisaurus apodus thracius	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Elaphe quatuorlineata quatuorlineata	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Elaphe quatuorlineata sauromates	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Zamenis situla	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Malpolon monspessulanus insignitus	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Lacerta trilineata dobrogica	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Telescopus fallax fallax	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Ophisops elegans macrodactylus	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Lacerta trilineata trilineata	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Podarcis taurica taurica	2	2	2	?	0	0	0	0	0	0	0	0	0	0	0
Platyceps najadum dahlii	2	2	2	?	0	0	0	0	0	0	0	0	0	0	0
Natrix natrix persa	2	2	2	3	0	0	0	0	0	0	0	0	0	0	0
Lacerta viridis meridionalis	2	2	2	1	?	0	0	0	0	0	0	0	0	0	0
Lacerta agilis chersonensis	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0
Darevskia praticola pontica	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0
Vipera ursinii moldavica	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0
Testudo graeca ibera	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0
Testudo hermanni boettgeri	2	2	2	1	1	1	1	1	0	0	0	0	0	0	0
Emys orbicularis	2	2	2	1	1	1	?/3	0	0	0	0	0	0	0	0
Natrix tessellata tessellata	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0
Vipera ammodytes meridionalis	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0
Podarcis erhardii riveti	2	2	2	2	1	1	1	1	0	0	0	0	0	0	0
Podarcis muralis cf. *maculiventris*	2	2	2	1	0	3	0	0	3	0	0	0	0	0	0
Lacerta viridis viridis	2	2	2	2	2	1	1	1	1	0	0	0	0	0	0
Ablepharus kitaibelii stepaneki	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0
Vipera ammodytes ammodytes	1	2	2	2	1	1	1	1	0	0	0	0	0	0	0
Dolichophis caspius	2	2	2	2	1	1	1	1	0	0	0	0	0	0	0
Natrix natrix natrix	1	2	2	2	2	1	1	1	1	1	0	0	0	0	0
Coronella austriaca austriaca	1	2	2	2	2	2	1	1	1	1	0	0	0	0	0
Zamenis longissimus longissimus	2	2	2	2	2	2	1	1	1	1	0	0	0	0	0
Podarcis muralis muralis	1	2	2	2	2	1	1	1	1	1	1	0	0	0	0
Anguis fragilis fragilis	0	1	1	2	2	2	2	2	1	1	0	0	0	0	0
Lacerta agilis bosnica	0	?	1	1	2	2	2	2	1	1	1	1	1	0	0
Vipera berus	0	0	0	?	1	1	1	2	2	2	2	2	1	1	0
Lacerta vivipara	0	0	0	0	1/?	1	2	2	2	2	2	2	2	1	1

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Table 3. Chorotype classification of Bulgarian amphibians and reptiles. Chorotype names after Vigna Taglianti et al. (1999) with modifications

Chorotype	*Number of species*		*Species*
	amphibians	*reptiles*	
Eurosiberian	1	2	*Rana temporaria*, *Lacerta vivipara*, *Vipera berus*
Turanian–European–Mediterranean	2	1	*Rana ridibunda*, *Bufo viridis*, *Emys orbicularis*
Central Asian–European–Mediterranean	-	1	*Natrix natrix*
Central Asian–European	1	3	*Pelobates fuscus*, *Lacerta agilis*, *Natrix tessellata*, *Vipera ursinii*
Turanian–Mediterranean	1	9	*Pelobates syriacus*, *Testudo graeca*, *Mauremys rivulata*, *Ophisaurus apodus*, *Ophisops elegans*, *Typhlops vermicularis*, *Elaphe quatuorlineata*, *Dolichophis caspius*, *Platyceps najadum*, *Telescopus fallax*
European–Mediterranean	2	-	*Salamandra salamandra*, *Hyla arborea*
European	3	2	*Triturus alpestris*, *T. vulgaris*, *Bufo bufo*, *Anguis fragilis*, *Coronella austriaca*
South European	2	4	*Bombina variegata*, *Rana dalmatina*, *Testudo hermanni*, *Lacerta viridis*, *Podarcis muralis*, *Zamenis longissimus*
Central European	2	-	*Bombina bombina*, *Rana* kl. *esculenta*
Mediterranean	-	2	*Eryx jaculus*, *Malpolon monspessulanus*
Eastern Mediterranean	3	9	*Triturus dobrogicus*, *T. karelinii*, *Rana graeca*, *Mediodactylus kotschyi*, *Lacerta trilineata*, *Darevskia praticola*, *Podarcis erhardii*, *P. taurica*, *Ablepharus kitaibelii*, *Platyceps collaris*, *Zamenis situla*, *Vipera ammodytes*
Cosmopolitan	-	2	*Caretta caretta*, *Chelonia mydas*
Total species	17	35	

Table 4. Protected status of the Bulgarian herpetofauna according to the national and international legislation (marine turtles excluded).

Species	*BG*	*Number of protected species*					
		BPA	*RDB*	*92/43*	*BERN*	*CITES*	*IUCN*
Salamanders and newts	5	5	1	2	5	-	2
Frogs and toads	12	12	1	11	12	-	2
Turtles	2	2	1	2	2	-	1
Tortoises	2	2	-	2	2	2	2
Lizards	13	6	2	10	13	-	-
Snakes	16	13	6	12	16	1	2
Total	50	40	11	39	50	3	9

BG, number of species found in Bulgaria; BPA, 2002 Biodiversity Protection Act [Bulgaria]; RDB, Red Data Book of Bulgaria, 1985; 92/43, Habitats Directive 92/43/EEC; BERN, Bern Convention; CITES, Convention on the International Trade in Endangered Species of Wild Fauna and Flora; IUCN, 2003 IUCN Red List of Threatened Animals (www.redlist.org).

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