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HERPETOFAUNA OF MALA VRBICA AND VAJUGA

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This paper presents the diversity of the herpetofauna of Mala Vrbica and Vajuga in the municipality of Kladovo, as well as potential factors threatening amphibian and reptile species in this area. Field research was conducted during the year 2024. Based on field research and literature data, the research area is inhabited by 23 species (of which 13 species are amphibians and 10 species are reptiles), which makes up 50% of the autochthonous herpetofauna of Serbia. Potential factors threatening the herpetofauna of this area are: expansion of agricultural land, fires, illegal landfills, and potentially the use of pesticides in agricultural production.

Key words: diversity, amphibians, reptiles, Mala Vrbica, Vajuga, threat factors

INTRODUCTION

In accordance with the submitted initiative, during the year 2024, expert associates of the Institute for Nature Conservation of Serbia con-

ducted field research in the Mala Vrbica and Vajuga areas with the aim of protecting this area as a natural asset. One of the aspects of the research was the herpetofauna. The research area (Fig. 1) is located between Mala Vrbica and Vajuga, two settlements in the municipality of Kladovo in the Bor district, in north-eastern Serbia on the right bank of the Danube. Mala Vrbica and Vajuga are parts of the Ramsar site "Đerdap" as well as the ecologically significant area "Mala Vrbica" of the ecological network of the Republic of Serbia. The research area is located within two internationally important bird areas (Important Bird Area – IBA) called "Mala Vrbica" and "Negotinska krajina". The scope of the research is within the boundaries of the potential Site of Community Importance (pSCI) "Mala Vrbica (Kladovska peščara, Kladovo-Kostol)" and two potential Special Protection Areas (pSPA) "Mala Vrbica" and "Negotinska krajina" of the Natura 2000 ecological network in accordance with the regulations of the European Union - Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Council Directive 1992) and – Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (Anonymous 2009).

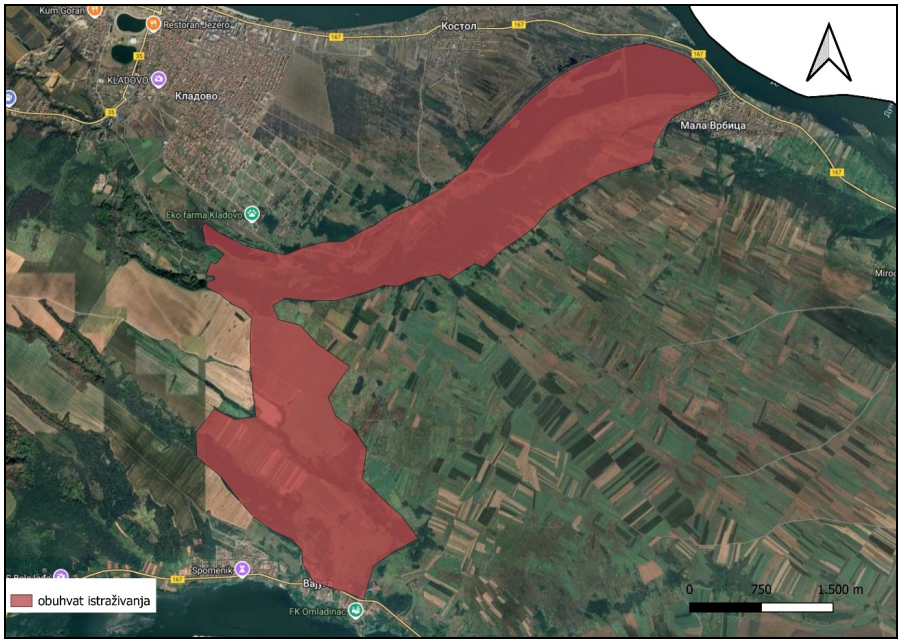

Fig. 1. – Research area between Mala Vrbica and Vajuga.

The Mala Vrbica and Vajuga areas are characterized by wetlands, agricultural areas and forest ecosystems. Canals, ponds and wet meadows provide a home for various animals, while orchards and agricultural areas surrounding the wetlands create a diverse landscape. According to the

Generalized habitat map of Serbia (Lakušić *et al*. 2021), the study area is dominated by xerophilous oak forests, terrestrial surface standing waters, agricultural habitats and Central Balkan grassland communities on rocky outcrops. Freshwater swamps, hygrophilic willow and poplar forests, moderately humid and humid grassland formations, broadleaf shrubs, terrestrial surface running waters and urban, industrial and other artificial habitats are also present (Fig. 2). Two watercourses flow through the southern part of the area, which flow into the Danube in the settlement of Vajuga: Valja Moruluj and Valja Satuluj. The unique mix of habitats of Mala Vrbica and Vajuga makes this area an interesting place to explore local biodiversity.

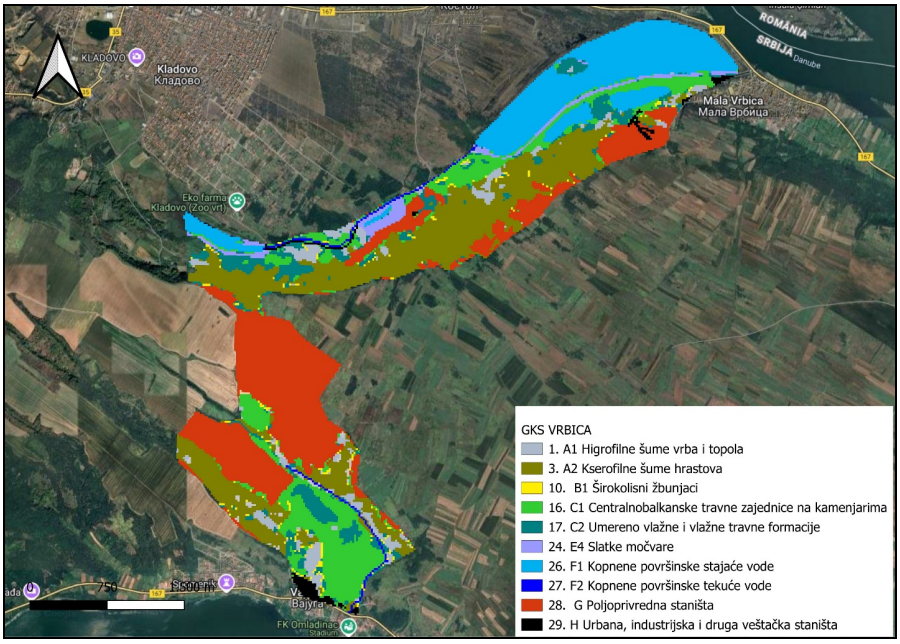

Fig. 2. – Habitat types in the area of Mala Vrbica and Vajuga according to the Generalized habitat map of Serbia (Lakušić *et al*. 2021).

Amphibians are almost cosmopolitan vertebrates. So far 8,887 amphibian species have been described (https://amphibiaweb.org). According to IUCN (2025) estimates, more than 41% of amphibian species are threatened. There are 22 amphibian species in Serbia: 14 species of tailless amphibians - frogs (order Anura) and 8 species of tailed amphibians (order Caudata) (Urošević *et al*. 2022a).

Similar to amphibians, reptiles are almost cosmopolitan vertebrates. So far 12,440 species of reptiles have been described (http://www.reptile-database.org/db-info/SpeciesStat.html). According to IUCN (2025) estimates, about 21% of reptile species are currently threatened. There are 26

indigenous species of reptiles in Serbia: three species of turtles (order Testudines), 13 species of lizards (suborder Lacertilia) and 10 species of snakes (suborder Serpentes) (Urošević *et al*. 2022a). Two species of reptiles are allochthonous to Serbia – *Trachemys scripta* ssp. and *Hemidactylus turcicus* (Urošević *et al*. 2022a).

The most significant threats to the amphibian and reptile fauna in Serbia are the degradation, destruction and fragmentation of species habitats, through urbanization and pollution, drying out of wetlands, deforestation, as well as biological (internal) factors (Krizmanić *et al.* 2015a, Ajtić *et al.* 2015).

The main goal of this paper is to present data on the diversity of amphibians and reptiles, which were collected in 2024, as well as the main threats to their populations in the area between the settlements of Mala Vrbica and Vajuga. A literature review of published data on the diversity of amphibians and reptiles from this area was also conducted.

MATERIAL AND METHODS

Field research in the area between the settlements of Mala Vrbica and Vajuga was conducted in April and June 2024, with the aim of valorizing the area for potential protection as a natural asset.

Species of amphibians and reptiles were searched by transects, visual inspection and by turning over natural and artificial shelters - under stones, logs, large waste, etc. For the purpose of sampling amphibians, a net was also used. After the catch, the time and place of the finds were recorded (GPS coordinates: Terenska app.). After processing and photography were completed, each individual was returned unharmed to the place of capture.

Species identification was done according to standard herpetological literature – Speybroeck *et al*. (2016). Taxonomy and nomenclature are given according to Urošević *et al*. (2022a).

RESULTS AND DISCUSSION

Class **Amphibia** Linnaeus, 1758

Order **Caudata** Scopoli, 1777 or **Urodela** Duméril, 1805

Family **Salamandridae** Goldfuss, 1820

Genus **Lissotriton** Bell, 1839

1. *Lissotriton vulgaris* (Linnaeus, 1758) – Smooth Newt

Genus **Salamandra** Garsault, 1764

2. *Salamandra salamandra* (Linnaeus, 1758) – Fire Salamander

Genus **Triturus** Rafinesque, 1815

3. *Triturus cristatus* (Laurenti, 1768) – Great Crested Newt

4. *Triturus dobrogicus* (Kiritzescu, 1903) – Danube Crested Newt

Order Anura Duméril, 1805

Family **Pelobatidae** Bonaparte, 1850

Genus **Pelobates** Wagler, 1830

5. *Pelobates balcanicus* Karaman, 1928 – Balkan Spadefoot Toad

6. *Pelobates fuscus* (Laurenti, 1768) – Common Spadefoot Toad

Family **Bufonidae** Gray, 1825

Genus **Bufo** Garsault, 1764

7. *Bufo bufo* (Linnaeus, 1758) – Common Toad

Genus **Bufotes** Rafinesque, 1815

8. *Bufotes viridis* (Laurenti, 1768) – Green Toad

Family **Bombinatoridae** Gray, 1825

Genus **Bombina** Oken, 1816

9. *Bombina bombina* (Linnaeus, 1761) – Fire-bellied Toad

10. *Bombina variegata* (Linnaeus, 1758) – Yellow-bellied Toad

Family **Hylidae** Rafinesque, 1815

Genus **Hyla** Laurenti, 1768

11. *Hyla arborea* (Linnaeus, 1758) – Common Tree Frog

Family **Ranidae** Batsch, 1796

Genus **Pelophylax** Fitzinger, 1843

12. *Pelophylax ridibundus* (Pallas, 1771) – Marsh Frog

Genus **Rana** Linnaeus, 1758

13. *Rana dalmatina* Fitzinger in Bonaparte, 1838 – Agile Frog

Class **Reptilia** Laurenti, 1768

Order Testudines Linnaeus, 1758

Family **Testudinidae** Batsch, 1788

Genus **Testudo** Linnaeus, 1758

1. *Testudo hermanni* Gmelin, 1789 – Hermann's Tortoise

Family **Emydidae** Rafinesque, 1815

Genus **Emys** Duméril, 1805

2. *Emys orbicularis* (Linnaeus, 1758) – European Pond Terrapin

Order Squamata Oppel, 1811

Family **Lacertidae** Batsch, 1788

Genus **Darevskia** Arribas, 1997

3. *Darevskia praticola* (Eversmann, 1834) – Meadow Lizard

Genus **Lacerta** Linnaeus, 1758

4. *Lacerta viridis* (Laurenti, 1768) – Eastern Green Lizard

Genus **Podarcis** Wagler, 1830

5. *Podarcis muralis* (Laurenti, 1768) – Common Wall Lizard

6. *Podarcis tauricus* (Pallas, 1814) – Balkan Wall Lizard

Family **Scincidae** Oppel, 1811

Genus **Ablepharus** Fitzinger in Eversmann, 1823

7. *Ablepharus kitaibelii* Bibron & Bory de Saint-Vincent, 1833 – Snake-eyed Skink

Family **Natricidae** Bonaparte, 1840

Genus **Natrix** Laurenti, 1768

8. *Natrix natrix* (Linnaeus, 1758) – Grass Snake

9. *Natrix tessellata* (Laurenti, 1768) – Dice Snake

Family **Colubridae** Oppel, 1811

Genus **Dolichophis** Gistel, 1868

10. *Dolichophis caspius* (Gmelin, 1789) – Caspian Whip Snake

During the field surveys a total of 194 individuals of herpetofauna species were captured, of which 27 were amphibians and 167 were reptiles. Of the 23 listed species, 6 species were not recorded during field surveys: the Danube crested newt (*Triturus dobrogicus*), the great crested newt (*Triturus cristatus*), the yellow-bellied toad (*Bombina variegata*), the fire-bellied toad (*Bombina bombina*), the common spadefoot toad (*Pelobates fuscus*) and the Balkan spadefoot toad (*Pelobates balcanicus*). Their presence in this area has been documented through literature data (Džukić *et al*. 2015, 2016, 2017, Vučić *et al*. 2020).

Based on literature data and field research, the area between the settlements of Mala Vrbica and Vajuga is inhabited by 13 species of amphibians, including nine tailless amphibians (order Anura) and four tailed amphibians (order Caudata), which represents 59,09% of the amphibian fauna in Serbia. According to Urošević *et al*. 2022a, the Republic of Serbia is inhabited by 22 species of amphibians. The most common recorded amphibian species in this area is the marsh frog (*Pelophylax ridibundus*), while the rarest species is the smooth newt (*Lissotriton vulgaris*).

According to literature data and field research, the area between the settlements of Mala Vrbica and Vajuga is inhabited by 10 species of reptiles, including two species of chelonians (order Testudines), five species of lizards (suborder Lacertilia) and three species of snakes (suborder Serpentes), which represents 38.46% of the reptile fauna in Serbia. According to Urošević *et al*. 2022a, the Republic of Serbia is inhabited by 26 species of reptiles. The most commonly recorded reptile species in this area are the European pond terrapin (*Emys orbicularis*) and the Balkan wall lizard (*Podarcis tauricus*), while the rarest species is the snake-eyed skink (*Ablepharus kitaibelii*).

According to the Regulation on the proclamation and protection of strictly protected and protected wild species of plants, animals and fungi (Anonymous 2010), almost all of the listed species of amphibians and reptiles are strictly protected, except for the marsh frog (*Pelophylax ridibundus*) and the Hermann's tortoise (*Testudo hermanni*), which are protected wild species. The eastern green lizard (*Lacerta viridis*) and the common wall lizard (*Podarcis muralis*) are not protected.

The species of the marsh frog (*Pelophylax ridibundus*) and the Hermann's tortoise (*Testudo hermanni*) are listed in Annex II of the Regulation on the control of the use and trade of wild flora and fauna (Anonymous 2005). In accordance with the aforementioned Regulation, the collection of the marsh frog from the wild for commercial purposes is prohibited in the areas of West Bačka, North Bačka, North Banat, South Bačka, Central Banat, Srem, South Banat, Podunavski, Braničevo, Bor and Rasinski districts. The collection of the Hermann's tortoise from the wild for commercial purposes is prohibited throughout the territory of Serbia.

The Red Book of the Fauna of Serbia I – Amphibians (Kalezić *et al*. 2015) classifies four amphibian species: the great crested newt (*Triturus cristatus*) – EN (Endangered), the Danube great crested newt (*Tritirus dobrogicus*) – NT (Near Threatened), the common spadefoot toad (*Pelobates fuscus*) – DD (Data Deficient) and the Balkan spadefoot toad (*Pelobates balcanicus*) – VU (Vulnerable). The Red Book of the Fauna of Serbia II – Reptiles (Tomović *et al*. 2015a) lists six species of reptiles: European pond terrapin (*Emys orbicularis*) – DD (Data Deficient), Hermann's tortoise (*Testudo hermanni*) – NT (Near Threatened), snake-eyed skink (*Ablepharus kitaibelii*) – EN (Endangered), meadow lizard (*Darevskia praticola*) – NT (Near Threatened), Balkan wall lizard (*Podarcis tauricus*) – LC (Least Concern) and Caspian whip snake (*Dolichophis caspius*) – DD (Data Deficient). Other recorded species according to the Red Books of the Fauna of Serbia have the status of LC (Least Concern).

Literature review

Literary data on the amphibian and reptile fauna of this area and its immediate surroundings are rare. There are only a few literary sources with very scattered data on the diversity of amphibians and reptiles of this area and its immediate surroundings.

The publication "Fauna repatih vodozemaca" (Džukić *et al*. 2016) states that the following species are found in Mala Vrbica and its immediate surroundings: fire salamander (*Salamandra salamandra*) – Kladovo, Osojna, Manastirica, Podvrška, Velesnica, Petrovo selo, Bajinov rit, Lolića rit; smooth newt (*Lissotriton vulgaris*) – Kladovo, Velesnica, Milutinovac; great crested newt (*Triturus cristatus*) – Kladovo, Brza Palanka; Danube crested newt (*Triturus dobrogicus*) – Velesnica.

Vučić *et al*. (2020) states that the following species are found: great crested newt (*Triturus cristatus*) in Kladovo and Brza Palanka; Danube crested newt (*Triturus dobrogicus*) in Velesnica.

In the paper on the distribution of lacertid lizards in Serbia states that the following species are found: eastern green lizard (*Lacerta viridis*) – Kladovo, Kladušnica, Mala Vrbica, Milutinovac, Rečica, Vajuga and Velika Vrbica; common wall lizard (*Podarcis muralis*) – Kladovo, Mala Vrbica, Velika Vrbica; Balkan wall lizard (*Podarcis tauricus*) – Kladovo, Brza Palanka, Kladovo, Mala Vrbica, Velika Vrbica; meadow lizard (*Darevskia praticola*) – Kladovo, Velesnica (Urošević *et al*. 2015).

The paper on the distribution of colubrid snakes in Serbia states that the following species are found: Caspian whip snake (*Dolicophis caspius*) – Kladovo, Mala Vrbica, Velika Vrbica; grass snake (*Natrix natrix*) – Kladovo, Mala Vrbica, Velika Vrbica; dice snake (*Natrix tessellata*) – Kladovo, Mala Vrbica, Vajuga, Velika Vrbica (Tomović *et al*. 2015b).

Urošević *et al*. (2018) reports the findings of the agile frog (*Rana dalmatina*) in Tekija and Velesnica.

Urošević *et al*. (2022b) reports the findings of the common tree frog (*Hyla arborea*) in Vajuga and Velesnica and Milutinovac.

Ljubisavljević *et al*. (2014), in their work on the distribution patterns of the Hermann's tortoise (*Testudo hermanni*) in the former Yugoslavia, reports the findings of the species near the site of Podvrška near Kladovo.

Ljubisavljević *et al*. (2015), in their work on the distribution of the snake-eyed skink (*Ablepharus kitaibelii*) in Serbia, reports findings from the immediate vicinity of Mala Vrbica and Vajuga: Rečica, Velesnica, Tekija and Kladovo.

In their work on the distribution of the European pond terrapin (*Emys orbicularis*) in Serbia Krizmanić *et al*. (2015b) reports the findings of the

species in the vicinity of Kladovo: Mala Vrbica, Velika Vrbica and Milutinovac.

The batrachological and herpetological collection of the Institute for Biological Research "Siniša Stanković" of the University of Belgrade contains specimens of amphibians and reptiles collected in the research and the immediate surroundings: common toad (*Bufo bufo*) - Kladovo and Vrbica; red-bellied toad (*Bombina bombina*) – Kladovo and Mala Vrbica; yellow-bellied toad (*Bombina variegata*) – Kladovo; common tree frog (*Hyla arborea*) – Milutinovac; common spadefoot toad (*Pelobates fuscus*) – Mala Vrbica, Lolića rit; Balkan spadefoot toad (*Pelobates syriacus*) – Mala Vrbica, Lolića rit; agile frog (*Rana dalmatina*) – Mala Vrbica, Lolića salaš; smooth newt (*Lissotriton vulgaris*) – Manastirište, Milutinovac and Brza Palanka; great crested newt (*Triturus cristatus*) – Brza Palanka; eastern green lizard (*Lacerta viridis*) – Korbovo; meadow lizard (*Darevskia praticola*) – Velesnica; snake-eyed skink (*Ablepharus kitaibelii*) – Velesnica and Manastirica; Caspian whip snake (*Dolichophis caspius*) – Vajuga (Džukić *et al.* 2015, Džukić *et al.* 2017).

Threatening factors

During field research in the area between the settlements of Mala Vrbica and Vajuga in the year 2024, various threats to amphibian and reptile populations were identified: fragmentation and destruction of habitats by their conversion to agricultural land, fires, illegal dumping, and potentially the use of pesticides in agricultural production.

Expansion of agricultural land

According to Haddad *et al*., 2015, habitat loss and fragmentation have reduced biodiversity by up to 75% worldwide in the last 30 years. Land transformation due to agricultural practices and urbanization is a significant threat to biodiversity (Sala *et al.* 2000). Agricultural land is expanding rapidly worldwide, and urban areas are projected to expand from 0.3 to 1.8 billion hectares by 2050 (Kitzes *et al*. 2008). In relation to land transformation, amphibians and reptiles are among the most vulnerable groups of animals due to their low vagility (Schutz & Driscoll 2008), sensitivity to environmental changes (Cosentino *et al*. 2011) and dependence on microhabitats (Valentine *et al*. 2007). Various authors have shown that the expansion of agricultural land negatively affects the diversity and abundance of herpetofauna species populations (Guerra & Araoz 2015, Biaggini & Corti 2015). It has also been proven that the use of pesticides in agricultural production negatively affects herpetofauna (Davidson & Knapp 2007, Mingo *et al*. 2016).

Field research has shown that the largest areas in the vicinity of the research area are arable agricultural land. It can be assumed that a large part of the natural and semi-natural habitats of amphibians and reptiles in this area have been converted for agriculture and that populations of these vertebrates have remained only in intact parts of the habitat, in forests and forest edges, meadows and wetlands. The largest number of amphibians and reptiles was recorded precisely in such intact parts of the habitats that were not converted for agricultural production, but a small number of individuals were also recorded on the edges of fields, orchards and vineyards, most of which were individuals of the Balkan wall lizard (*Podarcis tauricus*) and the Hermann's tortoise (*Testudo hermanni*). It can be assumed that pesticides and other biocides are used to increase the yield of agricultural products in this area, which would have a negative effect on the amphibian and reptile fauna. However, during field research, the use of chemical agents, such as pesticides, was not observed in the present arable lands, orchards and vineyards.

Fires

Due to their devastating effects, fires are considered one of the main threats to biodiversity (Malhi *et al*. 2014). The impact of fires on fauna can be diverse. On the one hand, several studies have shown the negative effects of fires, where burning has destroyed habitats and food resources and dramatically changed microclimatic conditions in burned and adjacent areas (Letnic *et al.* 2005, Kodandapani *et al*. 2008). On the other hand, some studies have shown that burning has positive effects on certain groups, such as opportunistic predators (Geary *et al*. 2019), whose prey becomes more vulnerable due to increased exposure in areas where vegetation has burned (Fuhlendorf *et al*. 2006, Hutto 2008). Fires can be particularly devastating for slow-moving species (Kiss & Magnin 2006), such as the Hermann's tortoise (Vujović *et al*. 2015).

Fires are also a significant threat to amphibian and reptile fauna in the area between the settlements of Mala Vrbica and Vajuga, especially during the warm season. Intentional arson, but also climate change, can be considered the most significant causes of fires in this area. Field research has recorded a significant number of dead Hermann's tortoise that died in fires. The dead Hermann's tortoises were found in locations where traces of burning were still visible.

Illegal landfills

Illegal landfills and wastewater are another significant threat to amphibian and reptile fauna in the Mala Vrbica and Vajuga areas. Illegal landfills and wastewater are the result of negligent human behavior and the lack of legal regulations to address this problem. The garbage consists of

food, paper waste and other toxic materials, such as paints, batteries, asbestos, medical waste, sewage sludge and radioactive material (Ojoawo 2011). Inadequately disposed waste can contaminate soil and groundwater (Taylor & Allen 2006). Illegal landfills can cause habitat degradation and loss, especially if freshwater ecosystems are nearby. In addition, wastewater leads to changes in the physical, chemical and biological characteristics of freshwater, which has a significant negative effect on amphibian fauna, especially their eggs and larvae (Zeitler *et al*. 2021). Field surveys pointed out on several large and a large number of small illegal landfills in the study area. Illegal landfills are mainly illegally dumped municipal and construction waste. Municipal waste, such as floating bottles and other plastic objects, has also been recorded in aquatic habitats, such as canals and ponds.

Although there are no data on the capture and intentional killing of amphibians and reptiles in this area, this type of (direct) threat to populations should not be overlooked. In addition, amphibians and reptiles have been recorded being run over on local roads.

CONCLUSION

The area between the settlements of Mala Vrbica and Vajuga, in the municipality of Kladovo, is very important for biodiversity, as it has different types of ecosystems that are suitable for the life and reproduction of many groups of animals, including amphibians and reptiles. Based on literature data and field research, the studied area is inhabited by 23 species of amphibians and reptiles: nine species of tailless amphibians (order Anura) and four species of tailed amphibians (order Caudata), two species of turtles (order Testudines), five species of lizards (suborder Lacertilia) and three species of snakes (suborder Serpentes). This number of recorded species of amphibians and reptiles is not final. In order to obtain detailed information on the diversity and state of populations of amphibian and reptile species in this area, it is necessary to conduct long-term faunal surveys. Field research has identified various threatening factors for amphibian and reptile populations in this area, so in order to protect them, it would be necessary to protect the area as soon as possible.

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ХЕРПЕТОФАУНА МАЛЕ ВРБИЦЕ И ВАЈУГЕ

МАРКО ДИВАЦ

Р Е З И М Е

У овом раду представљен је диверзитет фауне водоземаца и гмизаваца Мале Врбице и Вајуге у општини Кладово. Такође, обрађени су и потенцијални фактори угрожавања врста водоземаца и гмизаваца на овом подручју. Теренска истраживања су спроведена током 2024. године и обухватала су активну потрагу јединки по трансектима, а у циљу валоризације подручја и заштите као природног добра. Површина истраживаног простора износи 7,98 хектара. Врсте водоземаца и гмизаваца тражене су методом насумичног претраживања терена, по трансектима, визуелном инспекцијом и превртањем природних и вештачких склоништа – испод камења, трупаца, крупног отпада и сл. За потребе узорковања водоземаца, коришћен је и мередов. Након улова бележено је време и место налаза (GPS координате: Теренска апликација). На основу литературних података и теренских истраживања, простор Мале Врбице и Вајуге насељава 23 врста (од чега су 13 врста водоземци а 10 врста гмизавци), што чини 50% аутохтоне херпетофауне Србије. Теренским истраживањима ухваћено је укупно 194 јединки херпетофауне од чега 27 јединки водоземаца и 167 јединки гмизаваца. Истраживано подручје насељава укупно 13 врста водоземаца, и то девет безрепих водоземаца (ред

Anura) и четири репата водоземца (ред Caudata), као и 10 врста гмизаваца и то две врсте корњача (order Testudines), пет врста гуштера (подред Lacertilia) и три врсте змија (подред Serpentes). Од 23 наведене врсте теренским истраживањима није пронађено шест врста: подунавски велики мрмољак (*Triturus dobrogicus*), велики мрмољак (*Triturus cristatus*), црвенотрби мукач (*Bombina bombina*), жутотрби мукач (*Bombina variegata*), обична чешњарка (*Pelobates fuscus*) и балканска чешњарка (*Pelobates balcanicus*), већ је њихово присуство на овом подручју евидентирано провером литературних података. Потенцијални фактори угрожавања херпетофауне овог подручја су: уништавање и фрагментација станишта пренаменом у пољопривредне површине, пожари, дивље депоније, а потенцијално и употреба пестицида у пољопривредној производњи. Простор између насеља Мала Врбица и Вајуга, у општини Кладово, је веома важно за биодиверзитет, јер има различите типове екосистема који су погодни за живот и размножавање многих група животиња, укључујући водоземце и гмизавце. Да би се добиле детаљне информације о диверзитету и стању популација врста водоземаца и гмизаваца на овом простору потребно је спроводити дугорочна фаунистичка истраживања.