In the most recent comprehensive distribution of vipers in the western and central Balkans, 210 precise records (146 UTM cells) for all three species of vipers (*Vipera ammodytes*, *V. berus*, and *V. ursinii*) were presented for Serbia. During the past eight years, extensive field investigations within the ongoing conservation projects in our country (e.g. Ecological Networks and Natura 2000), significantly increased the number of faunistic records, which urged the need for publishing the updated distribution of all three species of vipers in Serbia. We collected a total of 770 records of vipers in Serbia, of which literature data constitute 49.4% (*n* = 380) and unpublished field data made as much as 50.6% (*n* = 390) of the records. As expected, *V. ammodytes* was the best-represented species, accounting for 614
records (79.8%), followed by *V. berus* with 145 records (18.8%), and *V. ursinii* with 11 records (1.4%). Results of the present study showed that in our country there are three areas crucially important for the diversity of vipers, with all three species present: Koritnik Mt. and Žljeb Mt. in Metohija, as well as Mokra Gora Mt. in south-western Serbia. We also found 25 10×10 km UTM squares with sympatry of two species of vipers. The designation of areas of special importance for vipers (e.g. Mokra Gora Mt., Dukat Mt., Besna kobila Mt., Kamena Gora Mt.) should be one of the priority actions for improvement of their conservation statuses in our country.

**Keywords:** *Vipera ammodytes*, *V. berus*, *V. ursinii*, distribution ranges, sympatry, conservation

**INTRODUCTION**

The most recent comprehensive distribution of vipers in the western and central Balkans (including Serbia) was provided by Jelić *et al.* (2012). In the given publication, 210 precise records (146 UTM cells) for all three species of vipers (*Vipera ammodytes*, *V. berus*, and *V. ursinii*) were presented for Serbia, both from literature sources and from field research (Jelić *et al.* 2012, and references therein). In addition, distribution of vipers was given in the Red Book of Fauna of Serbia II – Reptiles (Tomović *et al.* 2015a), but without precise locations, and only for the purpose of assessment of their conservation statuses.

The nose-horned viper, *Vipera ammodytes* (Linnaeus, 1758), is widely distributed in Serbia; the major part of its distribution covers the hilly-mountainous regions south of the Sava and Danube rivers (Tomović 2015). In the Peripannonian and the Pannonian regions, only a few localities were confirmed (Tomović *et al.* 2010, Jelić *et al.* 2012). Its altitudinal distribution in Serbia ranges from 100 to 2100 m a.s.l. (Jelić *et al.* 2012). According to morphological data and results of geostatistics (Tomović 2006, Tomović *et al.* 2010), two subspecies of the nose-horned viper inhabit our country, *V. a. ammodytes* and *V. a. montandoni*. However, molecular studies (Ursenbacher *et al.* 2008) revealed that three different genetic clades occur: north-western Serbia is inhabited by the clade corresponding to the nominotypic subspecies, extreme south and southeast by the clade matching *V. a. montandoni*, while the unique “Serbian” clade is present in the major part of the country.

The distribution of the adder, *Vipera berus* (Linnaeus, 1758) in Serbia is extremely disjunct, and groups of populations are geographically highly isolated (Ajnić & Tomović 2015). It occurs in less than 50 UTM squares,
many of which are known only from the literature (Jelić et al. 2012). Concerning altitudinal distribution, there are two groups of populations: from lowlands and hills (southern Banat, southern Srem, and north-western Serbia), and from alpine zones (central, eastern, south-eastern and south-western Serbia, Kosovo and Metohija). The adder’s altitudinal distribution is between 70 and 2500 m a.s.l. (Jelić et al. 2012, Ajtić & Tomović 2015). Both lowland and alpine populations of the adder in Serbia belong to the Balkan subspecies, \( V. b. bosniensis \) (Jelić et al. 2012).

The meadow viper, \( V. u. macrops \) (Bonaparte, 1835), is one of the rarest reptile species in Serbia. Its distribution range is exceptionally disjunct and limited to the mountain ranges of the Scardo-Pindhic and Dinaric mountain systems in the south-western part of the country (Kosovo, Metohija and south-western Serbia), at altitudes above 1600 m a.s.l. (Tomović & Ajtić 2015). Both morphological data and molecular genetic studies (Ferchaud et al. 2012) revealed that subspecies \( V. u. macrops \) is present in Serbia (Jelić et al. 2012).

Importantly, all three viper species are strictly protected (\( V. berus \) and \( V. ursinii \)) or protected (\( V. ammodytes \)) by law in Serbia (Anonymous 2010a,b) but they are also under threats due to various human activities, both legal and illegal (Tomović et al. 2014, Tomović et al. 2015b). In this sense, the presence of vipers in the given areas increases the value of those places: at least two vipers can be viewed as umbrella species and could contribute to the conservation of entire ecosystems.

During the past eight years, publications related to certain regions of Serbia (e.g. Kosovo & Metohija – Tomović et al. 2018), as well as extensive field investigations within the ongoing conservation projects in our country (e.g. Ecological Networks and Natura 2000), significantly increased the number of faunistic records, which urged the need for publishing the updated distribution of all three species of vipers in Serbia.

**MATERIAL AND METHODS**

The present study included the recently published information on the distribution of vipers in the Republic of Serbia (e.g. Jelić et al. 2012, Tomović et al. 2018, and references therein) (Appendix I). New faunistic data were mostly collected from the year 2012 onward, and they were the result of ad-hoc observations by the authors and collaborators mentioned in the Acknowledgements (Appendix II). Since these observations were not obtained by systematic research, the absence of records in certain parts of the territory of Serbia does not imply the absence of vipers, but simply the
lack of data. Some distribution records presented in the Red Book of Fauna of Serbia II – Reptiles (Tomović et al. 2015a) were now omitted or corrected, because the locality data were imprecise (obtained from the Internet), the sources were not reliable enough and/or the findings were not confirmed (pers. comm.).

The collected records (both previously published and new) were mapped on the 10×10 km UTM (Universal Transverse Mercator) geographic coordinate grid system. All records were checked for plausibility and assigned to their respective UTM cells. Some record localities refer to areas rather than precise points and thus extend across two grid cells. For the analyses of diversity of vipers in Serbia, we used an application created in Visual Basic 6.1 in the program WinWord 2003 (Niketić 1999) and plotted on the 10×10 km National Grid UTM Reference for the Republic of Serbia.

Acronyms for Serbian regions: Bt – Banat; C – Central Serbia; E – Eastern Serbia; K – Kosovo; M – Metohija; NE – Northeastern Serbia; NW – Northwestern Serbia; Po – Great Pomoravlje; S – Southern Serbia; SE – Southeastern Serbia; SW – Southwestern Serbia; Sr – Srem; Š – Šumadija; W – Western Serbia. The boundaries of the regions on the maps are given according to Tomović et al. (2015a).

RESULTS

Catalogue of taxa and records

LITERATURE DISTRIBUTION RECORDS

**Vipera ammodytes** (Linnaeus, 1758)

**Bt** Bola Crkva: Kusić (v.), near Nera (r.), UTM EQ36, 23.10.2005., Džukić et al. 2017; UTM EQ37 (obs. I. Petrović, Džukić et al. 2005); C Blace: Prebreza (v.), UTM EN29, 09.08.1958, Džukić 1972; **Čelijisko Lake**, UTM EP10 (obs. R. Ajtijelić 31.05.2004, Jelić et al. 2012); **Goč Mt.**: mountain house, UTM DP72 (obs. K. Vasić 23.05.1977., Džukić et al. 2017); Sokoljska Reka (r.), UTM DP72, 05.06.1966, Džukić 1972; **Ibar Valley**: Ušće (v.), UTM DP71 (obs. K. Vasić 23.05.1977., Džukić et al. 2017); Sokoljska Reka (r.), UTM DP72, 05.06.1966, Džukić 1972; **Jastrebarsko Mt.**: Buci (v.), UTM EP21 (obs. D. Kataranovski 09.09.1979., Džukić et al. 2017); **Kopaonik Mt.**: Brzeće (v.), Ravelj Hill, UTM DN99 (obs. Lj. Tomović, R. Ajtijelić, D. Doković 27.08.2000, Jelić et al. 2012); UTM DN99 (obs. Lj. Tomović, R. Ajtijelić 28.08.2000., Džukić et al. 2017); Čajetinsko Brdo Hill, UTM DN88 (obs. M. Nikatić, D. Lukić 15.07.1983, Jelić et al. 2012); Jošanička Banja, Gornje Čamage (v.) - Donje Čamage (v.), UTM DP70, 16.07.1987., Džukić et al. 2017); Lukovska Banja, UTM EN07 (obs. M. Nikatić 31.05.2000, Jelić et al. 2012); **Šanac**, UTM DN79 (obs. Lj. Janković 24.08.1973., Džukić et al. 2017); **Treska**, UTM DN88 (obs. V. Bjedov 24.06.2005, Jelić et al. 2012); **Kuršumija**: Vlahinja (v.), UTM EN18 (obs. B. Milenković 02.07.1979., Džukić et al. 2017); UTM EN27 (obs. S. Obradović 10.09.1978., Džukić et al. 2017); **Prokuplje**: Donja Konjuša (v.), UTM EN38 (obs. D. Gagušić 13.09.1975., Džukić et al. 2017); Vića (v.), Ložde Hill, UTM EN38 (obs. Lj. Tomović, M. Tomović 15.06.1999., Jelić et al. 2012); Vodice (v.), UTM EN48 (obs. M. Petković 15.05.1981., Džukić et al. 2017); **Raška - Raška**: Leposavić, UTM DN79 (obs. M. Nikatić, G. Tomović 02.05.2004., Jelić et al. 2012); **Sokolovica Mt.**: Sokolov krš, UTM EN36 (obs. M. Nikatić, G. Tomović 01.05.1998, Jelić et al. 2012); **Stolovi Mt.**: Kamenica (v.), UTM
Trstenik: Donja Crnišava (v.), Zbeg Hill, UTM EP02, Jelić et al. 2012, Đukić et al. 2017); E Aleksinac: Kraljevo (v.), UTM EP52 (obs. M. Niketić 01.05.1983, Jelić et al. 2012); Devica Mt.: Ždrela Gorge, UTM EP72 (obs. M. Niketić 31.04.1983, Jelić et al. 2012); Dimitrovgrad: Smilovci (v.), surroundings, UTM FN57, 15.07.1957., Đukić et al. 2017); Knjaževac: Srviški Timok Gorge, Podvis (v.), UTM EP92 (obs. M. Niketić 15.05.1983, Jelić et al. 2012); Niš: Jelašnička Gorge, Inatovac Peak, UTM EN89 (obs. M. Niketić, G. Tomović 28.02.2001, Jelić et al. 2012); Jelašnica (v.), Prozorac, UTM EN89 (obs. M. Niketić 31.03.1984, Jelić et al. 2012); Radovanski Kamen, UTM EN89 (obs. M. Niketić 15.05.1988., Jelić et al. 2012); UTM EN89 (obs. R. Ajić 20.06.2005., Jelić et al. 2012); Kamenica (v.), Kamenička Reka (r.), UTM EP70 (obs. M. Niketić 31.05.1978, Jelić et al. 2012); Niška Banja, Banjsko Brdo, UTM EN89 (obs. M. Niketić 31.05.1980, Jelić et al. 2012); Seličevica Mt.: Mała Ibrovica, UTM EN78 (obs. M. Niketić 15.05.1978, Jelić et al. 2012); Sičevačka Gorge: Gradište (v.), Gradištanska Gorge, UTM EN99 (obs. B. Zlatković, G. Tomović 31.05.1997, Jelić et al. 2012); UTM EN99, Jović et al. 1997); Ječava Hill, UTM EN99, Jović et al. 1997); Krupac, UTM FN09, Jović et al. 1997); Kusača Hill, UTM FN09, Jović et al. 1997); Oblik, UTM EN99, Jović et al. 1997); Kruščica (v.), Via Militaris, UTM EN89 (obs. R. Ajić 24.06.2005., Jelić et al. 2012); Via Militaris, UTM EN89 (obs. R. Ajić 24.06.2005., Đukić et al. 2017); Sokobanja: Bovansko Lake, UTM EP53, EP63 (obs. V. Žikić 30.06.1998., Jelić et al. 2012); Stara Planina Mts.: Crni Vrh, UTM FP20, 14.08.1983, Jelić et al. 2012); Topli Do (v.), UTM FN49, Ivančević et al. 2007); Suva Planina Mt.: Donji Dušnik (v.), UTM EN87 (obs. Lj. Tomović 01.06.2005., Jelić et al. 2012); Gadžin Han, UTM EN88, Jelić et al. 2012); Gornji Dušnik (v.), UTM EN97 (obs. Lj. Tomović 01.06.2005., Jelić et al. 2012); Grnčar (v.), Lučnička Gorge, UTM FN06 (obs. M. Niketić 01.04.1989, Jelić et al. 2012); Kaletinac (v.), UTM EN97 (obs. M. Niketić 01.05.1976., Jelić et al. 2012); Lučnička Gorge, UTM FN06 (obs. L. Krmiznički 09.05.2000., Đukić et al. 2017); Mosor, UTM EN98 (obs. B. Zlatković, G. Anašković, Jelić et al. 2012); Šebet (v.), UTM EN97 (obs. B. Zlatković 01.07.2001., Jelić et al. 2012); Tremen, UTM EN98 (obs. B. Randelović 08.07.1997., Jelić et al. 2012); Svršiške Planine Mts.: Zeleni Vrh, UTM EP69 (obs. B. Zlatković, G. Anašković 15.07.1994, Jelić et al. 2012); Tresibaba Mt.: Miljkovac (v.), UTM EP91 (obs. M. Niketić, G. Tomović 01.05.2003., Jelić et al. 2012); Vlaška Planina Mt.: Jerma Gorge, Zvonačka Banja, UTM FN25 (obs. B. Zlatković 02.05.2002., Jelić et al. 2012); K Gavzovo Lake, UTM DN65, 694 m (obs. S. Petković, 14.06.2014., Tomović et al. 2018); Gnjilane: Buzalak (v.), Dobri Čiča Hill, UTM EN40 (obs. G. Đukić 17.05.1977., Đukić et al. 2017); Končulj (v.), UTM EN50, 08.2004., Đukić et al. 2017); Poneš (v.), UTM EN30, 616 m (obs. B. Aksić 15.08.2014, Tomović et al. 2018); Slivovo (v.), UTM EN21 (obs. J. Simić 07.09.1978., Đukić et al. 2017, Tomović et al. 2018); Strapaža (v.), UTM EN30, 716 m (obs. N. Todorović 02.06.2015., Tomović et al. 2018); UTM EN30, Pasuljević 1968); Ibar Valley: Ibarska Slatina (v.), Ceranjska Reka (r.), UTM DN86, 802 m, Đukić et al. 2017, Tomović et al. 2018); UTM DN86 (obs. G. Pasuljević 15.05.1975., Đukić et al. 2017); Kosovska Mitrovica: Vidomiric (v.), UTM DN84 (obs. J. Vase 02.08.2014., Tomović et al. 2018); UTM DN84, Fejerváry 1922); Leposavić: Berberište (v.), UTM DN77, 1035 m (obs. M. Tomotijević 22.07.2016., Tomović et al. 2018); Borikovac, UTM DN78 (obs. M. Tomotijević 16.06.2016., Tomović et al. 2018); Desetak (v.), UTM DN87, 751 m (obs. M. Tomotijević 23.07.2016., Tomović et al. 2018); Dobrava (v.), UTM DN86, 604 m (obs. M. Tomotijević 10.07.2017., Tomović et al. 2018); Donji Kranj (v.), UTM DN77, 448 m (obs. M. Tomotijević 10.07.2017., Tomović et al. 2018); Gnjedžane (v.), UTM DN77, 790 m (obs. R. Kostović, G. Pasuljević 24.05.1971., Đukić et al. 2017, Tomović et al. 2018); Ibarsko Postenje (v.), UTM DN78, 433 m (obs. M. Tomotijević 28.08.2017., Tomović et al. 2018); Jarijine (v.), UTM DN78, 695 m (obs. M. Tomotijević 29.07.2016., Tomović et al. 2018); Kijevoići (v.), UTM DN87, 838 m (obs. G. Pasuljević, R. Kostović 06.05.1973., Đukić et al. 2017, Tomović et al. 2018); Koporiče (v.), UTM DN87, 935 m (obs. G. Pasuljević 10.06.1971., Đukić et al. 2017, Tomović et al. 2018); Kruščevići (v.), UTM DN77 (obs. G. Pasuljević, R. Kostović 06.05.1973., Đukić et al. 2017); Lesak (v.), Kamen Hamlet, UTM DN77, 558 m (obs. M. Tomotijević 27.07.2017., Tomović et al. 2018); Moliće (v.), UTM DN87, 804 m (obs. M. Tomotijević 02.07.2016., Tomović et al. 2018); Potkomiće (v.), UTM DN77, 505 m (obs. M. Tomotijević 11.08.2016., Tomović et al. 2018); Sočanica (v.), UTM DN86, 560 m (obs. R. Novaković 08.07.1978., Đukić et al. 2017, Tomović et al. 2018); Stubica Hill, UTM DN87 (obs. M. Tomotijević 15.06.2016., Tomović et al. 2018); Tvarđan (v.), UTM DN87, 655 m
EM09, 713 m (obs. 15.03.1977., Džuki Fejérváry 1922); (obs. 2018); Džuki, UTM DN76 (obs. EN11, 622 m (obs. 2018); Džuki et al. 2017, Tomović et al. 2018); surrounding NATs, UTM DN87, 751 m (obs. M. Timotijević 23.07.2016., Tomović et al. 2018); Junake (v.), UTM DN76, 957 m (obs. D. Todorović 28.05.1978., Tomović et al. 2018); Rudine (v.), UTM DN76 (obs. N. Labus 05.06.2003., Tomović et al. 2018); Čar Planina Mts.: Brezovica, hotel “Narcis”, UTM EM07 (obs. P. Lazarević, Jelić et al. 2012); Prijevački Stream, UTM DM97, EM07 (obs. P. Jakšić 17.08.1996., Džuki et al. 2017); Durlov Potok, UTM EM06, 1700 m (obs. I. Krizmanić 26.06.1995., Tomović et al. 2018); Kodža Balkan Mt., Rusenica Gorge, Sveta Trojica Monastery, UTM DM88 (obs. I. Krizmanić, Tomović et al. 2018); Oštijak, Gornje Selo (v.), UTM DN97 (obs. R. Savić 27.07.1979., Tomović et al. 2018); the main peak, UTM DM87 (obs. M. Niketić 01.08.1991, Jelić et al. 2012); UM97, 864 m (obs. I. lić 12.08.1976., Tomović et al. 2018); Prevalac, UTM DN96 (obs. M. Hajredini 28.08.1979., Džuki et al. 2017, Tomović et al. 2018); Uroševačka Strana, UTM EM08, Karaman (1928); Uroševac: Gornje Nerodimlje (v.), UTM EM09, 713 m (obs. G. Pasuljević 10.07.1976., Džuki et al. 2017, Tomović et al. 2018); EM19, 15.03.1977., Džuki et al. 2017); Vučitrn: Čičavica Hill, UTM DN93, 03.07.1973, Jelić et al. 2012); Gornja Sudimlja (v.), UTM DN93, 597 m (obs. R. Grgur 09.06.1977., Džuki et al. 2017, Tomović et al. 2018); Zubin Potok: Lučka Reka (v.), UTM DN75, 891 m (obs. S. Bašanović 30.09.1976., Džuki et al. 2017, Tomović et al. 2018); Pridvorica (v.), UTM DN75, 679 m (obs. M. Orlović 17.06.2015., Tomović et al. 2018); Ugljare (v.), UTM DN75, 578 m (obs. M. Orlović 06.09.2015., Tomović et al. 2018); Zupče (v.), UTM DN84, 529 m (obs. M. Orlović 08.06.2015., Tomović et al. 2018); Zvečan: Banjska (v.), UTM DN85 (obs. D. Todorović 28.09.1978., Džuki et al. 2017); Valać (v.), UTM DN85, 499 m (obs. D. Todorović 04.05.1978., Tomović et al. 2018); M Đečani: Dečanska Bistrca Gorge, UTM DN31 (obs. V. Stevanović, 12.07.1977., Džuki et al. 2017); Dakovica: Babaj Boks (v.), Babaj Boks (v) - Deva (v.), UTM DM48 (obs. G. Džukić 18.07.1980., Džuki et al. 2017); UTM DM49 (obs. G. Pasuljević, G. Džukić 18.07.1980., Džuki et al. 2017); (obs. S. Šćepa 02.07.1980., Tomović et al. 2018); Bistražin (v.), Žrze (v.)- Bistražin (v.), gorge, UTM DM68, Džukić & Pasuljević 1979); Ereník (r.), UTM DM69 (obs. J. Rosandić, Jelić et al. 2012); UTM DM59, Fejerváry 1972); (obs. D. Čukadani 13.04.582., Tomović et al. 2018); Istok: Mojstir (v.), UTM DN63 (obs. D. Lakišić 26.09.1978., Džuki et al. 2017, Tomović et al. 2018); Osojane (v.), UTM DN62, 531 m (obs. D. Lakišić 24.04.1977., Džuki et al. 2017, Tomović et al. 2018); Šaljinovica (v.), UTM DN62 (obs. D. Lakišić, 24.05.1978., Džuki et al. 2017, Tomović et al. 2018); Klin: Kijev (v.), Iglačev (v.), UTM DN71 (obs. G. Pasuljević 12.09.1975., Džuki et al. 2017, Tomović et al. 2018); Volujak (v.), UTM DN61 (obs. B. Milosavljević, G. Pasuljević 01.07.1980., Džuki et al. 2017, Tomović et al. 2018); Korićan Mt.: Rapča (v.), UTM DM65 (obs. M. Hajredini 31.03.1980., Džuki et al. 2017, Tomović et al. 2018); Koznik Mt.: Miruša Canyon, UTM DN60, DN70 (obs. Devtić, Todorović 20.05.1977., Džuki et al. 2017); Orahovac, UTM DM69, 477 m (obs. S. Trajković 25.08.1976., Džuki et al. 2017, Tomović et al. 2018); Peć, UTM DN42, Kopstein & Wettstein 1920, Mertens & Mušer 1928; Prizren: Cevljen Mt., UTM DM76 (obs. Z. Rosandić, Jelić et al. 2012); Dojnice (v.), UTM DM87 (obs. R. Ajić, Tomović et al. 2018); Krajki (v.), UTM DM78 (obs. R. Ajić, Tomović et al. 2018); Landovica (v.), Beli Drim Valley, UTM DM77 (obs. J. Rosandić, Jelić et al. 2012); Lokvica (v.), UTM DM86, 07.09.1978., Džuki et al. 2017); Ljukinac (v.), UTM DM68 (obs. R. Ajić, Tomović et al. 2018); Prizrenska Bistrca Gorge, Dušanov Grad, UTM DM87 (obs. R. Ajić, Tomović et al. 2018); Duvska Gorge, Sveti Arhanđeli Monastery, UTM DM87 (obs. R. Ajić, Jelić et al. 2012);
Donji Milanovac, Lazareva Reka Canyon (obs. DN32, DN42 (obs. Džuki 18.09.1965., Džuki EQ40 (obs. et al. DM78 (obs. R. Ajetič, Tomović et al. 1922); Schwartz 1936); DM99, 859 m (obs. Džuki 01.05.1997., Jelić et al. 2012); Šmara, UTM EP45 (obs. Mt. Kaljaja, UTM EP48, 20.07.1997, Jelić et al. 2018); Sokolica, foothill, UTM EP58, Džuki et al. 2017); Suvaja (r.), UTM EP57 (obs. R. Ajetič, Tomović et al. 1972); Donji Milanovac: quarry, UTM EQ82, 17.09.1965., Džuki 1972); Veliki Greben, UTM EQ91, 18.09.1965., Džuki 1972); Derdapska Gorge: Kazani, UTM FQ04 (obs. M. Niketić 31.04.1994., Jelić et al. 2012); Štrbac, Golubinje (v.), UTM EQ92, 16.09.1965., Džuki 1972); Golubac: Dobra (v.), UTM EQ74 (obs. G. Tomović, P. Lazarević 15.04.2003., Jelić et al. 2012); UTM EQ54, 29.04.1986., Džuki et al. 2017); Homoljske Planine Mt.: Vukan, Veliki Vukan, UTM EQ40 (obs. M. Niketić 31.05.2003., Jelić et al. 2012); Kučajanske Planine Mt.: Mikuljska Reka Canyon, UTM EP67, 02.06.1983., Džuki et al. 2017); Kučevo, UTM EQ52, 04.1963., Džuki et al. 2017); Malinin Mt.: Lazareva Reka Canyon, Prerasti, UTM EP77 (obs. G. Džukić 09.07.1982., Džukić et al. 2017); Vrnjikica, UTM EP77 (obs. M. Niketić 15.05.1998, Jelić et al. 2012); UTM EP77, Jelić et al. 2012, Džukić et al. 2017); the main peak, UTM EP77 (obs. M. Niketić, D. Lukić 15.07.1984, Jelić et al. 2012); Miroč Mt., UTM FQ03 (obs. M. Rakovij 01.07.2005, Jelić et al. 2012); Negotin: Vrata (r.), Vrata Monastery, UTM FQ01 (obs. R. Ajetič 06.07.2005, Jelić et al. 2012); Paraćin: Baba Planina Mt., UTM EP45 (obs. M. Niketić, G. Tomović 01.05.2004, Jelić et al. 2012); UTM EP45 (obs. M. Niketić, G. Tomović 01.05.2004, Jelić et al. 2012); Petrovac: Gornjačka Gorge, Gornjak Monastery, UTM EQ40 (obs. M. Niketić 15.05.1986., Jelić et al. 2012); Oreškovic (v.), UTM EQ20 (obs. J. Bulić 01.05.1997., Jelić et al. 2012); Rtanj Mt.: Baba Peak, UTM EP74 (obs. Z. Dundarski 03.05.1977., Džukić et al. 2017); Kusača, UTM EP74 (obs. M. Niketić 01.06.1991., Jelić et al. 2012); Stol Mt.: plateau, mountain house, UTM EP99 (obs. D. Pavićević 19.05.1989., Džukić et al. 2017); Zaječar: Sokolovica, UTM PF17, 01.05.1908., Džukić 1972); NW Bogatić: Badovinci (v.), UTM CQ76 (obs. M. Paunjić, Jelić et al. 2012); Cer Mt., UTM CX3 (v.); Jablanik Mt.: Počut-Jablanik Mt., UTM CQ66 (obs. D. Dukovski 02.05.2002., Džukić et al. 2012); UTM CP99, 23.07.1998., Džukić et al. 2012); UTM CP99, Džukić 1972); Kruševac: Lipnik Hill, UTM CQ60, Bolkay & Ćurčić 1920, Bolkay 1924); Loznica: Paskovac (v.), UTM CQ52, Džukić et al. 2017); Zaječar (v.), Krivi Potok, UTM CQ52 (obs. M. Popović - Fant 01.02.1990., Džukić et al. 2017); UTM CQ52 (obs. M. Popović - Fant 05.04.1990., Džukić et al. 2017); Ljubovija: Gornja Trešnjica (v.), Trešnjica Canyon, UTM CP78 (obs. G. Džukić 27.05.1972., Džukić et al. 2017); Tribuća Canyon, UTM CP79, 05.07.1978., Jelić et al. 2012, Džukić et al. 2017); Mali Zvornik: Trešnjica Canyon, Jerin Grad, UTM CP88, Džukić et al. 2017); Košije (v.), UTM CP88, Džukić et al. 2017); Maljen Mt.: Brežde (v.), UTM DP29 (obs. M. Andjelković, A. Urošević 08.06.2017., Džukić et al. 2017); Divčibare, Paljba, UTM DP18, Džukić et al. 2017); Ritor, UTM DP28, 28.06.2003., Džukić et al. 2017); road to Divčibare, UTM DP18, P28 (obs. D. Katarovski, V. Cvetković 17.05.1994., Džukić et al. 2017); Medvednik Mt., UTM CP99, Jelić et al. 2012, Džukić et al. 2017); Girincišća Cave, UTM DP29 (obs. M. Đurić 14.05.2005., Džukić et al. 2017); Ribnička Gorge, UTM DP29 (obs. Đ. Dukovski 10.07.2000, Jelić et al. 2012); UTM DP29 (obs. G. Džukić 28.05.1980., Džukić et al. 2017); Povlen Mt.: Debelo Brdo Mt., Stubice Hill, UTM DP08 (obs. R. Ajetić 29.06.1999., Jelić et al. 2012, Džukić et al. 2017); Gornji Taor (v.), Mravinči Hamlet, Magleš Hill, UTM DP08 (obs.
D. Đoković 27.08.2005., Jelić et al. 2012); UTM DP08 (obs. Lj. Tomović, R. Ajić 01.05.2003., Jelić et al. 2012); Srednji Povlen, Kneževo Polje, UTM CP98 (obs. D. Jovanović, Džukić et al. 2017); **Suvobor Mt.**: Pranjani (v.), UTM DP37 (obs. D. Kataranovski, V. Cvetković 17.05.1994., Džukić et al. 2017); **Valjevo: Blizanje (v.),** UTM DQ11 (obs. M. Niketić, G. Tomović 02.05.2004., Jelić et al. 2012); Donje Leskovice (v.), UTM DP09, 14.09.2009., Džukić et al. 2017; Gradac (r.), Konjičko (g.), gorge, UTM DQ10 (obs. D. Đoković 19.05.2004, Jelić et al. 2012); **Suva (r.),** UTM DP09 (obs. A. Hegedűs 28.05.1992., Džukić et al. 2017); UTM DP09 (obs. I. Krizmanić 25.05.1995., Džukić et al. 2017); Gradac Gorge, Devojački Vrš, UTM DQ10 (obs. D. Đoković 11.09.2005, Jelić et al. 2012); Jablanica (r.), UTM CP99 (obs. I. Krizmanić 31.07.1991., Džukić et al. 2017); UTM DQ00 (obs. M. Niketić, I. Krizmanić 30.04.1994., Jelić et al. 2012); **Vršac: Petnica (v.),** Bujajić, UTM DP19 (obs. S. Stamenković 22.05.1985., Džukić et al. 2017); **Lazarevac: Gornji Starac (v.),** UTM CP99, Jelić et al. 2017); **Vlašić Hill:** UTM CP82 (obs. M. Niketić, G. Tomović 15.03.2004., Jelić et al. 2012); **Po Ćićevac:** Stalač, Stevanac, UTM EP33 (obs. R. Ajić, 23.03.2005., Džukić et al. 2017); UTM EP33 (obs. R. Ajić, Jelić et al. 2012); **Jagodina:** Dragoševac (v.), UTM EP15 (obs. G. Džukić, M. Kalezic 17.06.2001., Džukić et al. 2017); **Stalač:** Stalačka Gorge, Trubarevo (v.) - Cerovo (v.), UTM EP42 (obs. M. Niketić 30.04.1993, Jelić et al. 2012); **Svilajnac:** Bagrdanska Gorge, Gložane (v.), Miljkov Monastery, UTM EP19 (obs. M. Niketić, G. Tomović 15.04.2003, Jelić et al. 2012); UTM EP19, Jelić et al. 2012, Džukić et al. 2017); **Š Bujanovac:** Končuj (v.), UTM EN50 (obs. B. Lukić, Jelić et al. 2012); **Kukavica Mt.:** Krpejce (v.), UTM EN83 (obs. S. Antić, Jelić et al. 2012); Lebane: Grugrovce (v.), Šumanska River Gorge, UTM EN64 (obs. M. Živić 30.04.2002., Jelić et al. 2012, Džukić et al. 2017); **Medveda:** Mačedonce (v.), UTM EN44 (obs. M. Živić 30.04.2002., Jelić et al. 2012, Džukić et al. 2017); **Preševska Mitrovica:** UTM EM58, Ralev et al. 2013); **Vranje:** Kriva Feja (v.), UTM EN91, Džukić et al. 2017); **SE Bosilegrad:** Donja Lisina (v.), UTM FN11, 01.08.2003., Sterijovski 2014); Gornja Lisina (v.), Lisinski Lake, UTM FN11, 01.08.2001., Sterijovski 2014); Milevska Planina Mt.: Donja Ljubata (v.), UTM FN00 (obs. G. Anakev 01.06.2004., Jelić et al. 2012); **Starač:** Pečinja Valley, UTM EM78 (obs. Lj. Tomović, R. Ajić 24.05.2009., Džukić et al. 2017); Staraci (v.), Donji Starac, UTM EM78 (obs. R. Ajić 07.04.2004., Džukić et al. 2017); Gornji Starac, UTM EM78 (obs. Lj. Tomović, R. Ajić 05.05.2002., Jelić et al. 2012, Džukić et al. 2017); Gornji Starac, Hamlet Čivije, UTM EM78 (obs. Lj. Tomović, R. Ajić 05.05.2002., Jelić et al. 2012, Džukić et al. 2017); **Trgovište:** Donja Trnica (v.), Crnovska Gorge, UTM EM89 (obs. Lj. Tomović, R. Ajić 29.04.2000., Jelić et al. 2012, Džukić et al. 2012, Džukić et al. 2017); **Vlasina Plateau:** Brod (v.), Vlasina Gorge, UTM FN04 (obs. J. Ćrnobrnja 20.07.1982, Jelić et al. 2012); Vlasotince: Gložane (v.), UTM EN85, Jelić et al. 2012); **SW Viljevica Mt.:** Raždaja (v.), UTM DN28 (obs. G. Pusuljović, H. Mesić, Džukić et al. 2017); Ibarski Kolašin, UTM DN55 (obs. I. Pustić 20.04.1977., Džukić et al. 2017); **Jadovnik Mt.:** UTM DN09, Jelić et al. 2012); Mokra Gora Mt., UTM DN54, Bolkay 1924); **Novar Vrš:** Debela (v.), Božetići Hamlet, UTM DP11 (obs. B. Mitić 02.05.2003., Jelić et al. 2012); **Novi Pazar:** Vranovina (v.), UTM DN58, Džukić et al. 2017); Schwartz 1936); **Ozren Mt.:** Dubočica Gorge, UTM DN08 (obs. R. Ajić, Džukić et al. 2017); **Pešter Plateau:** Stjenica, Krš, UTM DN19 (obs. D. Mijajlović 15.08.1976., Džukić et al. 2017); **Prijepolje:** Divci (v.), UTM CN99 (obs. N. Labus 12.07.1996., Jelić et al. 2012, Džukić et al. 2017); Karoševina (v.), UTM CN89 (obs. N. Labus 10.06.1996., Jelić et al. 2012, Džukić et al. 2017); Mileševka Canyon, UTM CP90 (obs. R. Ajić, Jelić et al. 2012); Ninčići (v.), UTM CP91, 15.06.1996., Džukić et al. 2017); Sedobro (v.), Ninčići Hamlet, UTM CP90 (obs. N. Labus 20.07.1996., Jelić et al. 2012); Seljašnica (v.), UTM CP80 (obs. N. Labus 15.06.1996., Jelić et al. 2012, Džukić et al. 2017); UTM CP90, 29.09.2005., Džukić et al. 2017); **Zlatar Mt.:** Vranjak, UTM DP00 (obs. G. Anakev 25.07.2005, Jelić et al. 2012); Š Bukulja Mt., UTM DQ60, Radovanović 1951, Džukić 1972, Džukić et al. 2017); **Glediće Planine Mt.:** UTM DP95, Jelić et al. 2012); **Gornji Milanovac:** Brđanska Gorge, Brdani (v.), UTM DP57 (obs. M. Niketić, G. Tomović 03.05. 2004., Jelić et al. 2012); Vračevska (v.), UTM DP77, Džukić et al. 2017); Knjić: Barać (v.), Barački Krš, UTM DP66 (obs. M. Niketić, G. Tomović 08.04.2004., Jelić et al. 2012); Krugujevac: Dobrača (v.), Lazarević, UTM DP77 (obs. M. Niketić, G. Tomović 02.05.2004., Jelić et al. 2012); town, Komarice, UTM EP07, Jelić et al. 2012); **Bajina Bašta:** Drina (r.), Peručac Lake, UTM
Vipera berus (Linnaeus, 1758)

**Bt Vršački Breg Mt.:** Markovac (v.), UTM EQ39 (obs. J. Rašajski, 01.10.1969., Đukić et al. 2017); Široko Bilo, 500 m from mountain house, UTM EQ29 (obs. B. Božić, 26.05.1985., Đukić et al. 2017); mountain house, UTM EQ29 (obs. Lj. Tomović, Jelić et al. 2012); near mountain house, UTM EQ29 (obs. Lj. Tomović 02.10.2002., Đukić et al. 2017); UTM EQ29, 09.07.1988., Đukić et al. 2017; UTM EQ39 (obs. B. Božić, 26.05.1985., Đukić & Purger 1988); Č Kopaonik Mt.: Metode, DN89 (obs. M. Niketić, 31.07.1982, Jelić et al. 2012); Pančićev Vrh, Velika Ravan, UTM DN89, 18.07.1987., Đukić et al. 2017); UTM DN89, Jelić et al. 2012, Đukić et al. 2017); Suvo Rudnište, DN89 (obs. S. Matvejov 07.09.1954., Đukić et al. 2017); Žijeb, DN89 (obs. A. Rožaj 17.09.1987., Đukić et al. 2017); E Stara Planina Mts.: Arbinje, FN49 (obs. Lj. Tomović, R. Ajić, 25.07.1999, Jelić et al. 2012); Babin Zub, UTM FP30, Ivančević et al. 2007); Kopren, Tri Kladenca, UTM FN49 (obs. Lj. Tomović, R. Ajić 28.07.1999, Jelić et al. 2012); Midžor, near the border line, UTM FP30 (obs. I. Krizmanić 13.07.1991, Jelić et al. 2012); UTM FP30, Ivančević et al. 2007); Trem, UTM EN98 (obs. C. Gussev 08.07.1997, Jelić et al. 2012); Tri Kladenca, UTM FN49, Ivančević et al. 2007); Tupanar, UTM FP30 (obs. I. Krizmanić 14.07.1991, Jelić et al. 2012); Vučje Jame, Kozje Grbine, UTM FN58, Ivančević et al. 2007); Žarkova Ćuka, UTM FP30, Jelić et al. 2012, Ivančević et al. 2007); K Šar Planina Mts.: Durlov Potok, UTM EM06, 1900 m (obs. I. Krizmanić, 26.06.1995., Jelić et al. 2012); Jašinčačka Jezera Lakes, Gornje Šije, UTM DM97 (obs. I. Krizmanić 21.06.1995, Jelić et al. 2012); Livadica, Livadičko Lake, UTM DM96 (obs. M. Radovanović 17.08.1940, Radovanović 1951); Ljuboten Mt., UTM EM07, EM17, 18.06.1953., Đukić et al. 2017); Mekuš Bor, Careve Livade, UTM EM06 (obs. I. Krizmanić 27.06.1997, Jelić et al. 2012); Ošljak, DM97 (obs. I. Krizmanić 14.06.1996, Jelić et al. 2012); Piribeg, Brezovica, UTM EM06, EM07, 1300 m (obs. P. Jakić 20.07.1986., Đukić et al. 2017); Durlov Potok, UTM EM06, EM07, 03.07.1988., Đukić et al. 2017); UTM EM06, EM07 (obs. I. Savič 19.09.1967., Đukić et al. 2017); M Korićnik Mt., UTM DM65, Werner 1920); Mokra Gora Mt.: Savina Voda, UTM DN64 (obs. G. Đukić 09.06.1977., Đukić et al. 2017); Paštrik Mt.: Planeja (v.), Šeh Mahala, UTM DM67 (obs. R. Ajić, Jelić et al. 2012); Prokletije Mts.: Jerebinje, UTM DN64 (obs. I. Krizmanić 04.06.1996., Jelić et al. 2012); Žijeb Mt., UTM DN33, Schwartz 1936); Šar Planina Mts.: Ošljak, Gornješelsko Lake, UTM DM96 (obs. I. Krizmanić 19.06.1996., Jelić et al. 2012); Veljin Beg, UTM DM73 (obs. I. Krizmanić 24.07.1995., Jelić et al. 2012); NW Bogatić: Banovo Polje (v.), Batar (r.), UTM CQ87
Vipera ursinii (Bonaparte, 1835)

**M Koritnik Mt.**, UTM DM65, Werner 1920); **Paštrik Mt.**: Gorožup, UTM DM67, 1000-1100 m (obs. G. Đukić 19.07.1980., Đukić et al. 2017); Planeja (v.), Šeh Mahala, UTM DM67 (obs. R. Đurić 2006, Jelić et al. 2012); UTM DM67, Kopstein & Wettstein 1920, Kramer 1961); **Prokletije Mts.**: Žiljev Mt., Radavac (v., above, UTM DN33, Pasuljević 1968); **Šar Planina Mts.**: Crvena Gora, UTM DM54 (obs. G. Đukić & Purger 1988); **Stara Pazova**: Vranovska Gora (v.), UTM DN54, Schwartz 1936, Kramer 1961 [doubtful record]).

**NEW DISTRIBUTION RECORDS**

*Vipera ammodytes* (Linnaeus, 1758)

**Čičevci**: Trubarevo (v.), UTM EP32 (obs. R. Đurić); **Goč Mt.** Bzenice (v.), Mitrov Polje, UTM DP91 (obs. J. Danilović 07.07.2007.); **Ibar Valley**: Bogotovac (v.), UTM DP63, 271 m (obs. A. Urošević, M. Đurić 06.08.2018., NP “Kopaonik” project); Maglič - Grad, Jelenino Kupatilo, UTM DP62 (obs. S. Đurić 19.06.2004.), Maglič - Bogotovac (v.), road, UTM DP63, 263 m (obs. A. Urošević 07.07.2019.); UTM DP62 (obs. A. Simović 10.07.2012.); **Jastrebac Mt.**: Mali Jastrebac, Janovce Vode, UTM EP50 (obs. G. Đukić); **Kopaonik Mt.** Jošanička Banja, Gobeljska Reka (r.), UTM DP80, 870 m (obs. L. Krizmanić); Krmeljica, UTM DN79, 1150 m, 29.05.2006.; Smeteneš (v.), Slap, UTM DN79, 1012 m (obs. T. Vučić, M. Đurić, A. Urošević 08.08.2018., NP “Kopaonik” project); Treska, UTM DN88, 1620 m (obs. Lj. Janković); **Kraljevo**: Gokčanica (v.), UTM DP71 (obs. A. Mitić 2015); Studenica Valley, Studenica Monastery, UTM DP61 (obs. M. Krstić); **Kruševac**: Klik Hill, UTM EP10 (obs. R. Đurić); **Kuršumlja**: Prodom Banja, UTM EN36, 634 m (obs. J. Ćorović 06.05.2015.); Rača (v.), UTM EN26, 434 m (obs. J. Ćorović 24.06.2014.); Vrševac (v.), UTM EN28, 2019; **Raška**: Radosiče (v.), UTM DN79, 554 m (obs. J. Ćorović 22.04.2014.); **Stolovi Mt.**: Žiča (v.), Žiča Reka (r.), UTM DP73 (obs. A. Simović 09.07.2012.); **Trstenik**: Bogdanje (v.), UTM EP03, 292 m (obs. M. Marić 23.06.2018.), 372 m (obs. A. Golubović 23.06.2018., BIOLOGER); Grabovac (v.), Jerin Grad, UTM DP93, 213 m (obs. A. Golubović 05.09.2013., Rufford project 20507-B); UTM DP93, 317 m (obs. J. Ćorović 15.04.2016.); Lozna (v.), UTM DP93 (obs. A. Simović); surroundings, hill above town, UTM EP02 (obs. A. Simović 24.03.2012.); **E Aleksinac**: Prčilovica (v.), school, UTM EP51 (obs. G. Đukić); **Bela Palanka**: Gornja Korenica (v.), Korenica Gorge, UTM FN07, 458.8 m (obs. J. Ćorović 07.04.2016.); Kremenica (v.), Bela Palanka - Pirot;...
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Vipera berus (Linnaeus, 1758)

**Br Vršac:** Malo Središte (v.), UTМ EQ39, 270 m (obs. I. Krizmanić); Mesić (v.), Dumbrava, UTМ EQ39, 186 m (obs. G. Đukić, M. Kalezic, M. Marković); UTМ EQ39 (obs. A. Simović 26.03.2011.); (obs. M. Krstić); Sočica (r.), UTМ EQ39 (obs. M. Krstić); **Vršački Breg Mt.**: Đakov Vrh, UTМ EQ29 (obs. M. Krstić); UTМ EQ39 (obs. M. Krstić); Gudurički Vrh, UTМ EQ39, 620 m (obs. I. Krizmanić); (obs. A. Simović 03.04.2011.); Široko Bilo, mountain house, UTМ EQ29, 325 m (obs. A. Urošević, N. Preradović 29.04.2012.); (obs. M. Krstić); mountain house "Vršačka kula", UTМ EQ29, 370 m (obs. A. Urošević 26.06.2011.); **Vršačka kula**, UTМ EQ29, 330 m (obs. I. Krizmanić); **Vršačka Glavica**, UTМ EQ29 (obs. M. Krstić); **C Kopanik Mt.** Barska Reka (r.), UTМ DN89, 1370 m (obs. T. Vučić, M. Ajduković, M. Mikić, M. Andelković, T. Vukov, M. Cvijanović, A. Urošević, 07.08.2019., NP "Kopanik" project); Bečirovac, Srebrenac farm, UTМ DN89, 1578 m (obs. D. Jović 19.08.2009.); **Nebeski Stolice**, UTМ DN88, 1784 m (obs. A. Urošević, M. Andelković 04.07.2018., NP "Kopanik" project); Oštri Krš, UTМ DN89, 1687 m (obs. Lj. Janković 01.07.1957.); Pančićev Vrh, UTМ DN89, 1940 m (obs. I. Krizmanić); Suvo Rudište, Krčmar, UTМ DN89, 1810 m (obs. I. Krizmanić).

**E Bukovik Mt.**, UTМ EP54, 1200 m (obs. S. Maninković, 23.03.1988. [doubtful record]); **Stara Planina Mts.**: Arbinje, UTМ FN49, 1700 m (obs. I. Krizmanić); (obs. A. Simović 13.07.2008.); Babin Zub, UTМ FP30 (obs. A. Simović 11.07.2009.); Bratkova Strana, UTМ FN49 (obs. A. Simović 13.07.2008.); Jabučko Ravniště, UTМ FP20 (obs. A. Simović 17.07.2012.). Kropen, Šošina Vunija, UTМ FN49, 1860 m (obs. G. Đukić 02.07.2008.); UTМ FN49, 1800 m (obs. I. Krizmanić); (obs. A. Simović 15.07.2009.); Krvave Bare, UTМ FN49 (obs. A. Simović 15.07.2009.); Midžor, UTМ FP30,
1851 m (obs. M. Maričić 27.09.2019.); 2119 m (obs. M. Maričić 27.09.2019.); Ponor, Lokve, UTM FN49, 1460 m (obs. I. Krizmanić); Stara Karaula, UTM FN49, 1700 m (obs. I. Krizmanić); Senkokos (v.), towards Srebna Glava, UTM FN68, 1576 m (obs. M. Andelković 04.08.2016.); Srebna Glava, UTM FN57 (obs. A. Simović 10.07.2011.); Stražna Ćuka, Šošina Vunija - Kopren, UTM FN49, 1779 m (obs. G. Đukić, M. Kalezić. D. Jović 02.07.2008.); UTM FN49 (obs. A. Simović 15.07.2010.); Topli Do (v.), UTM FN49, 1190 m (obs. I. Krizmanić); Vražja Glava, UTM FP40 (obs. A. Simović 15.07.2009.); Zavojsko Lake, Pakleštica (v.), UTM FN48, 950 m (obs. I. Krizmanić); Žarkova Ćuka, UTM FP30 (obs. A. Simović 10.07.2009.); Suva Planina Mt.: Kozja Padina, UTM EN98, 1650 m (obs. M. Niketić 15.06.1993.); K Copaonik Mt.: Beo Brdo, UTM DN88, 1260 m (obs. I. Krizmanić); Šar Planina Mts.: Brezovica, above, UTM EM07, 2200 m (obs. A. Paunović 29.07.1995.); Ošljak, Mušnikovo (v.), Bivoli, UTM DM96, 1890 m (obs. I. Krizmanić); Popovo Prase, UTM DM97, 1760 m (obs. I. Krizmanić); Virovi, UTM DM97, 1650 m (obs. I. Krizmanić); Pavlov Kamen, UTM DM96, 2000 m (obs. I. Krizmanić); Pribeg, Stojkova Kuća, UTM EM06, 1700 m (obs. V. Stevanović 30.05.1977.); 2300 m (obs. I. Krizmanić); Štrpce, Kaluđerska Reka (r.), UTM EM07, 1400 m (obs. I. Krizmanić); EM07, 975 m (obs. G. Pasuljević 25.06.1968.); M Koritnik Mt.: Rapča (v.), UTM DM65 (obs. M. Hajredini, 20.05.1980.); Mokra Gora Mt.: Savina Voda, UTM DN64, 1650 m (obs. I. Krizmanić); Prokletije Mts.: Bogičevica Mt., Prilepske Planine Mt., UTM DN21, 2100 m (obs. I. Krizmanić); Deravica Mt., Erenik (r.), UTM DN30, 1690 m (obs. I. Krizmanić); Nedžinat Mt., Veliko Nedžinatsko Lake, UTM DN22, 1850 m (obs. I. Krizmanić); Žijeb Mt., Rusulija, UTM DN33, 1870 m (obs. I. Krizmanić); Šar Planina Mts.: Kodža Balkan Mt., Ostrovljica, UTM DN49, 1800 m (obs. M. Niketić 1989); Konjukša Mt., Moravica, UTM DM96, 1950 m (obs. M. Niketić 19.08.2011.); Veljin Beg, Gorni Def, lake, UTM DM73, 2075 m (obs. I. Krizmanić 28.07.1995.); NE Derdapska Gorge: Štrbac, Veliki Štrbac, UTM FQ03 (obs. I. Krizmanić, 20.04.1994. [doubtful record]); SE Besna kobila Mt.: vrh, UTM FN00, 1924 m (obs. Lj. Tomović, A. Golubović, S. Đorđević, 07.06.2014., MEP “DNA” project); Černikov Mt.: Veliki Černikov, Bela Voda, UTM FN03, 1447 m (obs. M. Maričić 04.09.2016.); Troskač, UTM FN03, 1566 m (obs. I. Tot 23.07.2018.); Vlasina Plateau: Crna Trav-a - Brod (v.), UTM FN04, 959 m (obs. S. Marić 20.07.2015.); Gradiska (v.), Bukurovac, UTM FN14, 1543 m (obs. G. Đukić, M. Kalezić 22.06.2007.); Ćuka, UTM FN14, 1350 m (obs. G. Đukić, M. Kalezić 22.06.2007.); Mlačište (v.), Mlačište Mehane, UTM FN03, 1270 m (obs. G. Đukić 27.09.2008. [extinct population]); UTM FN03, 1268 m (obs. G. Đukić 19.03.2007. [extinct population]); Topli Do, Pandžin Grob, UTM FN02, 1531 m (obs. M. Maričić 05.09.2016.); Vlasina (r.), Livade Hamlet, UTM FN04, 1000 m (obs. G. Đukić 23.09.2007.); Vlasina Rid (v.), Gramada, UTM FN03, 1301 m (obs. I. Tot 29.05.2018. [extinct population]); UTM FN03, 1293 m (obs. I. Tot 22.07.2019.); St Fruška Gora Mt.: Čortanovci (v.), UTM DR20 (obs. Đ. Murić); Slankamenčki Vinogradi (v.), Koševac Hill, UTM DR30 (obs. N. Aleksić 15.05.1974.); Pečinci: Donji Tovarnik (v.), UTM DQ16 (obs. R. Ajtić 2013); Obrež (v.), Obreda Bara, Matijevica, UTM DQ15, 80 m (obs. I. Krizmanić); SW Golija Mt.: Kladnica (v.), Javor Peak, UTM DP20 (obs. S. Marinković); Jadovnik Mt.: Božov Potok (v.), UTM DN09 (obs. N. Mitić 17.08.2018., BIOLOGER); Kamena Gora Mt., UTM CN89 (obs. M. Miljević 02.08.2016., BIOLOGER); Mokra Gora Mt.: Bandera, Vučje Jame, UTM DN44, 1604 m (obs. Lj. Tomović, A. Simović, S. Marić, A. Golubović, M. Krstić, I. Krizmanić, S. Đorđević 12.06.2014., MEP “DNA” project); Ponor, UTM DN54, 1536 m (obs. Lj. Tomović, A. Simović, S. Marić, A. Golubović, M. Krstić, I. Krizmanić, S. Đorđević 13.06.2014., MEP “DNA” project [doubtful record]); Strašnik, Crvene Vode, UTM DN54, 1880 m (obs. Lj. Tomović, A. Simović, S. Marić, A. Golubović, M. Krstić, I. Krizmanić, S. Đorđević 13.06.2014., MEP “DNA” project); W Javor Mt.: Ljepojevići (v.), Jankov Vrh, UTM DP21, 1492 m (obs. S. Marinković); Zlatibor Mt.: Mokra Gora (v.), UTM CP74 (obs. D. Cirović 17.07.1993.).

Vipera ursinii (Bonaparte, 1835)
Analysis of taxa and records

We collected a total of 770 records of vipers in Serbia, of which literature data constitute 49.4% (n = 380) and unpublished field data made as much as 50.6% (n = 390) of the records. As expected, *V. ammodytes* was the best-represented species, accounting for 614 records (79.8%), followed by *V. berus* with 145 records (18.8%), and *V. ursinii* with 11 records (1.4%). In total, vipers were recorded in 304 of 1,408 10×10 km UTM squares within the territory of the Republic of Serbia (21.6% of the country area).

The nose-horned vipers were recorded in 270 10×10 km UTM squares: 90 new field records, 70 reconfirmed published records and 110 literature data (Fig. 1). The adders occur in 52 10×10 km UTM squares: 23 new field records, 16 reconfirmed published records and 13 literature data (Fig. 2). The meadow vipers exist in seven 10×10 km UTM squares: two new field records, one reconfirmed published record and four literature data (Fig. 3).

In the territory of Serbia, there are 1,104 (78.4%) UTM cells without any records of vipers. This was actually quite expected since in many areas these snakes are naturally not present (major parts of the Pannonian and Peripannonian regions) and their secretive lifestyle often makes chance observations impossible, but also because systematic research is still lacking in some large regions (e.g. Pomoravlje, south-western Serbia and Kosovo).

Results of this study showed that in four 10×10 km UTM squares in Serbia all three species of vipers occur: two of them are in Metohija (Koritnik Mt. – DM65, Prokletije Massif, Žljeb Mt. – DN33) and two others are in south-western Serbia (Mokra Gora Mt. – DN44, DN54) (Figure 4).

We also found 25 10×10 km UTM squares with sympatry of two species of vipers. Co-existence of *V. ammodytes* and *V. berus* is the most frequent in Serbia (22 UTM squares), and it was recorded in the following regions/locations: Metohija: Prokletije Massif – Junička Mt. and Đeravica Mt. (DN30); Kosovo: the Šar Planina Massif – Ošljak Mt. and Kodža Balkan Mt. (DM96, DM97), Piribeg and Brezovica (EM06, EM07); western Serbia: Zlatibor Mt. (CP74), Javor Mt. (DP21); south-western Serbia: Kamena Gora Mt. (CN89), Jadovnik Mt. (DN09); central Serbia: Kopaonik Mt. (DN88, DN89); eastern Serbia: Suva Planina Mt. (EN98), Stara Planina Mts. (FP30, FN48, FN49, FN57); south-eastern Serbia: Dukat Mt. (FM19), Besna kobila Mt. (FN00), Milevska Planina Mt. (FN11), Čemernik Mt. (FN03) and the Vlasina plateau (FN04, FN14) (Figure 4).

Sympatry of *V. berus* and *V. ursinii* was recorded in two UTM squares (Metohija: Paštrik Mt. – DM67, the Šar Planina Massif – Veljineg and Čemerička Mt. – DM73), while co-occurrence of *V. ammodytes* and *V. ursinii* was the rarest, with only one UTM square recorded (Metohija: the Šar Planina Massif – Ošljak Mt. and Kobilica Mt. – DM86) (Figure 4).
Fig. 1. – Records of *Vipera ammodytes* (Linnaeus, 1758) in the Republic of Serbia. Red dots – new data; red-black dots – reconfirmed published data; black dots – previously published data.
Fig. 2. – Records of *Vipera berus* (Linnaeus, 1758) in the Republic of Serbia. Red dots – new data; red-black dots – reconfirmed published data; black dots – previously published data; crosses – extinct populations; question marks – doubtful records.
Fig. 3. – Records of *Vipera ursinii* (Bonaparte, 1835) in the Republic of Serbia. Red dots – new data; red-black dots – reconfirmed published data; black dots – previously published data; question marks – doubtful records.
DISCUSSION

Although the distribution of *V. ammodytes* was already well-known from the previous publications (e.g. Jelić et al. 2012, Tomović et al. 2018), the results of the present study increased the current knowledge on its distribution by app. 33%, in terms of addition of unpublished data (90 of 270 UTM squares). As observable from Figure 1, there are still relatively large gaps in the distribution of the nose-horned viper in the Peripannonian region (Pomoravlje and Šumadija), as well as in the south-western part of Serbia. Therefore, more systematic faunistic research is needed in these particular regions.

Concerning distribution of *V. berus*, some doubtful records (CQ73, CQ83, DP70, DQ62, DQ64, DP49, DP59) presented in the Red Book of Fauna of Serbia II – Reptiles (Ajić & Tomović 2015) were excluded due to unreliable sources, but two data from north-eastern and eastern Serbia (FQ03, EP54) still remain to be verified in the future. Several very old unpublished (DR20, DR30) and published records (CR90, DR00, DQ09 – Živković 1956, Radovanović 1957, 1964, Prša 1959, Popović et al. 1999) for the Fruška Gora Mt., together with the fact that no specimens were found there in the last 20 years, indicate that populations of the adder are very small and rare on this mountain. Populations from the following localities should be regarded as extinct: surroundings of Belgrade (village Stari Banovci, DQ48 – Anonymous 1932), the Avala Mt. (village Ripanj, DQ64 – Anonymous 1890, Karaman 1939), and mouth of the Velika Morava River (Godominsko polje, EQ04 – Karaman 1948), since there are no records/findings, except for the 70 years old literature data. Loss of the adequate habitats due to the urbanization, industrialization or agriculture could be a reason for the loss of some populations. For instance, the habitat around Velika Morava river mouth (i.e. Godominsko polje) was severely degraded in 1967 and 1970, by land reclamation and filling of the Jezava riverbed in order to construct an industrial zone (Tasić 2014, Urošević 2018). Adder presence in the Peripannonian region, south-western and south-eastern parts of Serbia could be expected, hence future faunistic research should be conducted in these regions.

The very old record of *V. ursinii* from the surroundings of Novi Pazar (village Vranovina, DN58 – Schwarz 1936, Kramer 1961) should be regarded as doubtful since in this area there are no suitable high mountain habitats (Jelić et al. 2012). Future studies should be focused on the south-western part of Serbia, where new localities of meadow viper could be expected.

According to the study of Jelić et al. (2013), the only Important Viper Area in Serbia was the Šar Planina Massif. However, results of the present study showed that in our country there are three additional areas crucially
Fig. 4. – The number of species of the genus *Vipera* on the 10×10 km UTM National Grid Reference with the number of squares.
important for the diversity of vipers, with all three species present: Koritnik Mt. and Žljeb Mt. in Metohija, as well as Mokra Gora Mt. in south-western Serbia. We strongly recommend to the policymakers in the government institutions that these mountains should be recognized and included in different types of legally protected areas (e.g. National Parks and/or Natura 2000 sites). In addition, sympatri of two species of vipers was also recorded in 25 locations, most of which are already included in the protected areas in the Republic of Serbia (e.g. Stara Planina Mts., Kopaonik Mt., Suva Planina Mt., Zlatibor Mt., Vlasina Plateau). However, some other mountains should also be considered as important areas for vipers and included in the protected sites (e.g. Dukat Mt., Besna kobila Mt., Kamena Gora Mt.).

The conservation status of the vipers was given in the Red Book of Fauna of Serbia II – Reptiles (Tomović et al. 2015a). According to the IUCN criteria, *V. ammodytes* was considered as the least concerned species (LC), while *V. berus* and *V. ursinii* were considered as vulnerable (VU) and endangered (EN), respectively. Although both *V. berus* and *V. ursinii* are strictly protected, and *V. ammodytes* is protected by law in the Republic of Serbia (Anonymous 2010a, 2010b), the designation of areas of special importance for vipers should be one of the priority actions for improvement of their conservation statuses in our country.

All the data compiled in this study, as well as those which will be collected within the two national projects (Ecological Networks and Natura 2000) shall be presented to the national authorities and institutions responsible for the designation of appropriate protection upon areas which are proven to be important for the existence of vipers. These snakes should be seriously taken into consideration as the species which can properly indicate the state of entire habitats. However, to achieve the sound, long-term preservation of the viper species and their habitats, in addition to prescribing formal conservation measures, both strict control in the field (rangers, inspectors) and well-designed educational activities must be undertaken, from schoolchildren (see Ballouard et al. 2013) and laypeople to decision-makers and judiciary.

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SUPPORTING INFORMATION

Online Appendix:

Appendix I – Literature distribution records of three Vipera species in the Republic of Serbia with regions, broad locations, exact localities, toponyms, UTM 10×10 km squares, longitudes, latitudes, altitudes, dates of observations, literature sources; r – river, v. – village.

Appendix II – New distribution records of three Vipera species in the Republic of Serbia with regions, broad locations, exact localities, toponyms, UTM 10×10 km squares, longitudes, latitudes, altitudes, dates of observations, names of observers; r – river, v. – village. For conservation reasons, precise geographic coordinates of some locations are omitted.
Распрострањење три врсте рода *Vipera* у Републици Србији

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Јелена Ћоровић, Ана Павловић, Данко Јовић, Миловој Крстић,
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Резиме

Литературни подаци о дистрибуцији рода *Vipera* на подручју западног и централног дела Балканског полуострва, показују да је у Србији забележено 210 налаза (146 UTM поља) за све три врсте овог рода (*Vipera ammodytes*, *V. berus* и *V. ursinii*). Током последњих осам година, интензивна фаунистичка истраживања у оквиру националних конзервационих пројеката (нпр. Еколошке мреже и Natura 2000), допринела су значајном повећању броја података о дистрибуцији ове три врсте, чиме се указала потреба за објављивањем нових фаунистичких података. У овом раду, укупно је сакупљено 770 података о распрострањењу представника рода *Vipera* у Србији, од чега литератуарни подаци чине 49.4% (*n* = 380), а нови фаунистички подаци представљају 50.6% (*n* = 390). Очекивано, највећи број података се односи на врсту *V. ammodytes* (614 – 79.8%), док је много мање података за врсте *V. berus* (145 – 18.8%) и *V. ursinii* (11 – 1.4%). Резултати овог рада су показали да на територији Републике Србије постоје три подручја од највећег значаја за диверзитет рода *Vipera*, на којима су присутне све три врсте: планине Коритник и Жљеб у Метохији, као и планина Мокра гора у југозападној Србији. Такође, забележено је укупно 25 UTM 10×10 km квадрата у којима по две врсте рода *Vipera* живе у симпатрији. Проглашење заштићених подручја од посебног значаја за отровнице (нпр. Мокра гора, Дукат, Бесна кобила, Камена гора), требало би да буде приоритет за побољшање конзервационог статуса врста рода *Vipera* у нашој земљи.