

New sightings of *Zootoca vivipara* (Lichenstein, 1823) (Squamata, Lacertidae) in Bosnia and Herzegovina

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Abstract

Zootoca vivipara is a poorly investigated lizard species in Bosnia and Herzegovina. The species is often associated with mountain ecosystems in the Dinaric area. For the first time we present all records of this species in Bosnia and Herzegovina. By analysing data from literature, the herpetological collection (National Museum) and from field work, we conclude that this species mainly inhabits the northern and central parts of the country. The amount of data is still small, but it is believed that its distribution is underestimated. Therefore, the conservation status of *Z. vivipara* in Bosnia and Herzegovina should be considered as: Data Deficient (DD).

Key words: viviparous lizard, distribution, Bosnia & Herzegovina, Dinarides, conservation

INTRODUCTION

The genus *Zootoca* WAGLER, 1830 is monotypic (HARRIS & CARRETERO, 2003) only represented by the species *Zootoca vivipara* (LICHENSTEIN, 1823) with five described subspecies: *Z. v. sachalinensis*, *Z. v. pannonica*, *Z. v. carniolica*, *Z. v. louislantzi* and *Z. v. vivipara*. Populations inhabiting the Dinarides belong to the nominotypic subspecies (HORVÁTHOVÁ *et al.*, 2013).

This small lizard has the largest and northernmost area of distribution of any reptile species: it inhabits most parts of Eurasia (BÖHME, 1997). Ecologically, it is a very plastic species adapted to various types of habitats

raging from sea coast to the highlands. However, in the southern areas of distribution (Dinaric area), the species represents a typical faunistic element which prefers mountain meadows, but can also be found on wet ditches and canals, around ponds and wetlands, as well as edges of humid forests (DELY & BÖHME, 1984; JELIĆ *et al.*, 2012). Despite the mentioned facts, this seems to be one of the rarest and least studied reptiles in Bosnia and Herzegovina - B&H (ČENGIĆ, 2013).

The primary goal of this work is to summarize all currently known and available data about this species in B&H.

MATERIALS AND METHODS

In order to gather as many records as possible for *Z. vivipara* in B&H, we analysed all available literature data that mentioned *Z. vivipara* in B&H

(BOLKAY, 1924, 1929, ARNOLD, 1987, WERNER, 1989, VEITH, 1991, GASC *et al.*, 1997, IZMIRLIJA *et al.*, 2007, BAŠKIERA, 2013, ZIMIĆ *et al.*, 2013, ŠUNJE *et al.*, 2014)

as well as unknown records from the collection deposited in the National Museum of B&H in Sarajevo. A small number of *Z. vivipara* records are cited in available publications as repeated records (VEITH, 1991; ZIMIĆ *et al.*, 2013; ŠUNJE *et al.*, 2015) which give the impression that there are more records than the original records actually show, therefore they are not included in the calculations (Graph 1).

On the European distribution map of *Z. vivipara* (GASC *et al.*, 1997) three points on the B&H map on scale 1:

RESULTS

With a total of 25 records of *Z. vivipara* in B&H, 14 (56 %) are related to the literature data, three (12 %) on information from the National Museum of B&H and eight from field research (32 %).

The first new field record refers to the north-eastern slope of Mt. Treskavica (approach from the village of Turovi – 35 km south-west from the capital – Sarajevo) where we observed few individuals of *Z. vivipara* one individual was photographed (Fig 1b). The microecosystem where the individual was registered represents a mesophilic meadow (S facing) along the forest border on 1582 m a.s.l.– Veliko jezero) is situated 500 m of airline from the locality (500 m in a straight line from the locality) (Figure 1a).

Second new field sighting refers to a mountainous part of the northern slope of Mt. Vlašić. One juvenile individual was caught on the plateau of Vlašić in the locality of Rječica (Figure 2a), on some rocks. The individual was caught, photographed and returned to the same location on 12 August 2014 (Figure 2b).

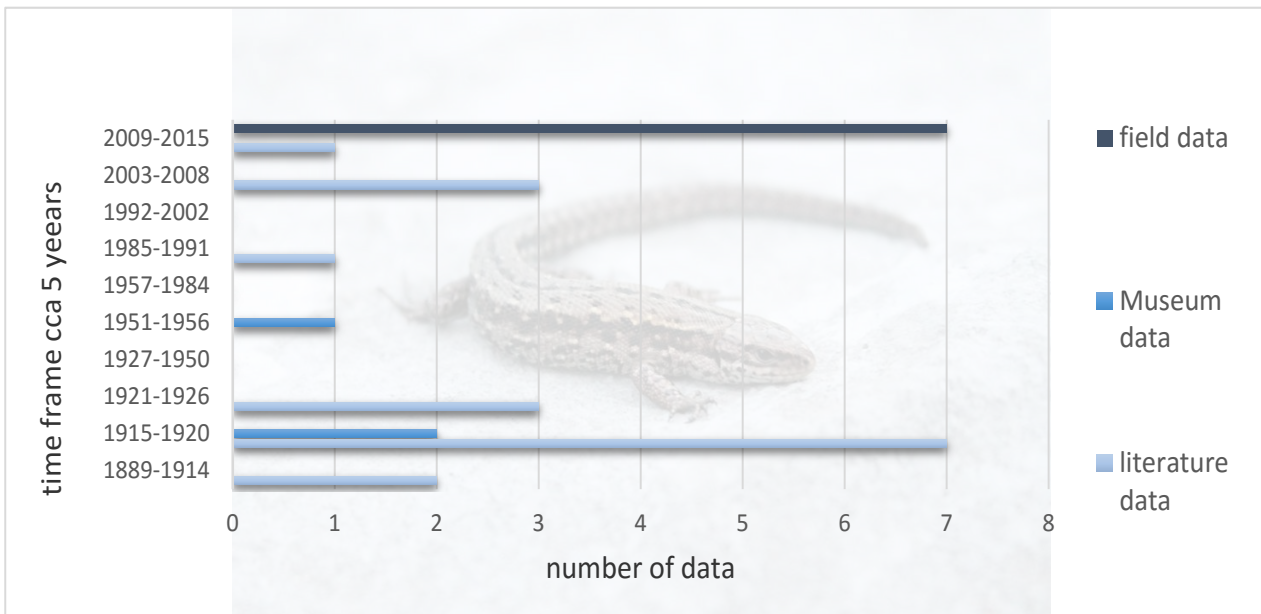
100 000 are presented. These points (in a broad sense) cover: Mt. Vlašić, Mt. Ozren and Mt. Čvrsnica. Because of lack of more detailed information, they are not taken in consideration in the presentation of our results.

We supplement the data with eight new precise records of *Z. vivipara* within the country, based on field research. Existing records and distribution map of this species in B&H are given in table 1 and figure 5.

The third new field record refers to the area near the town of Olovo, on the slopes of Mt. Zvijezda (locality: Orlja; 704 m a.s.l.) which represents the northernmost record in the country so far. One male individual was caught, photographed (Fig 2b) and released. The individual was also registered on a mesophilic meadow (SW facing) a few meters from a nearby stream (Figure 2a).

The fourth new field record refers to the south western slope of Mt. Čvrsnica (near Pločno peak; Figure 4a). One individual was caught (Figure 4b) during *Salamandra atra prenjenensis* research in the hydrophilic meadow (E facing) just before sunrise (5:00). Additionally, two individuals were caught on the same Mountain at the Ledeno Jezero location.

Additional new field information of *Z. vivipara* distribution in B&H was provided by D. Jelić on the area of Mt. Zelengora (Bljušturača) and Mt. Vlašić (40 individuals stretching from Devečani to Paljenik were observed).



Graph 1. Number of literature, field and museum records from Bosnia and Herzegovina over a period of 116 year

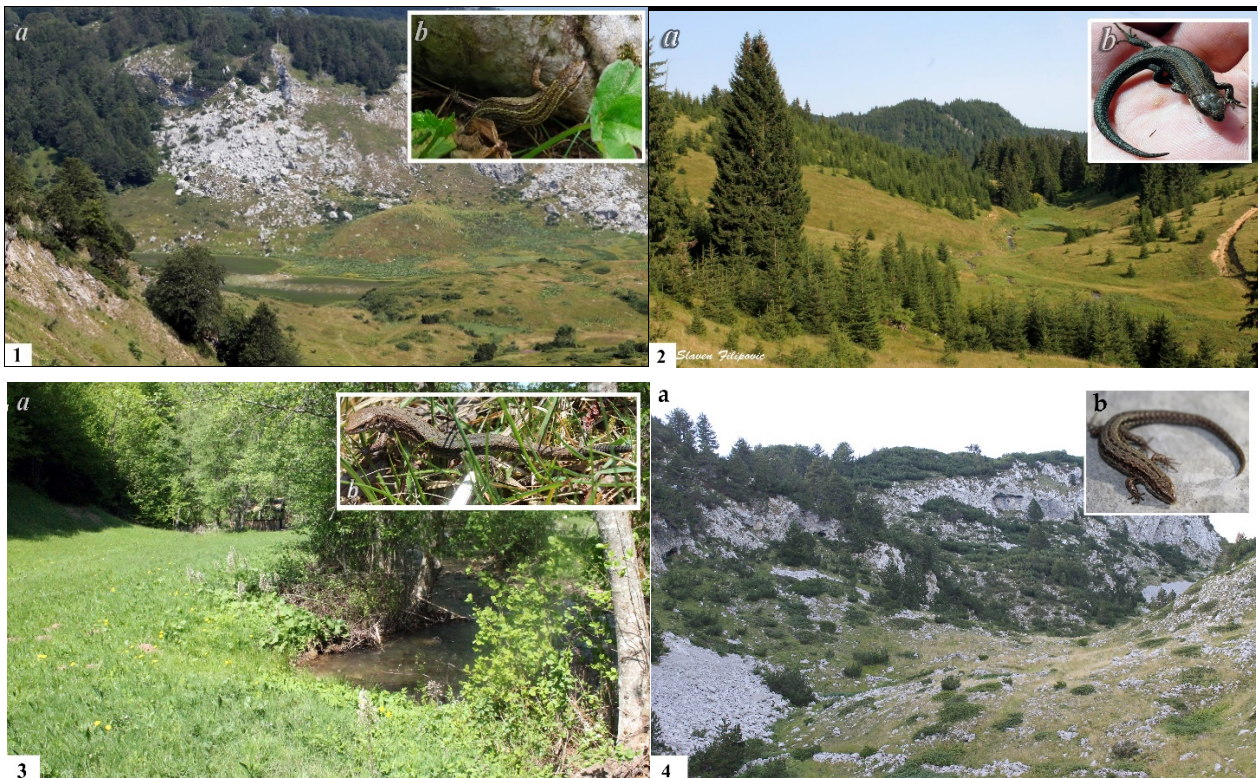


Figure 1 - 4. Subalpine (1a), mountain (2a), hilly/upland (3a) and alpine habitat (4a) with photographs of captured individuals of *Z. vivipara* (b) (photo 1: Šunje E; photo 2: Filipović S.; photo 3 and 4: Zimić A.); following the vertical profile of the Dinaric Alps of B&H (BH-CMH, 2010)

Table 1. All known records of *Zootoca vivipara* in Bosnia and Hezegovina

| Mountain | | Sublocation | | Date/year | Altitude | Coordinates | References |
|----------|------------------|---|-----------------------------|--------------------------|--------------|---------------|---|
| A | Vlašić | 1 | x | x | 1700 m | 44°18' 17°39' | WERNER, 1889; VEITH, 1991 |
| | | 2 | x | 2011 | 1800 m | | BAŠKIERA, 2013 |
| | | 4 | Rječica | 12/08/2014 | 1400 m | 44°21' 17°37' | new field record (leg. S. FILIPOVIĆ, det. A. ZIMIĆ) |
| | | 5 | Devečani | 2011 | 1760 m | 44°16' 17°37' | new field record (leg. et det. D. JELIĆ) |
| | | 6 | Paljenik | 2011 | 1933 m | 33°17' 17°40' | new field record (leg. et det. D. JELIĆ) |
| B | Prenj | x | | x | 2100 m | 43°31' 17°54' | WERNER, 1889; VEITH, 1991; ŠUNJE et al., 2014 |
| C | Čvrstica | 1 | Way to Pločno peak | 21/07/2015 | 1777 m | 43°36' 17°35' | new field record (leg. et det. A. ZIMIĆ) |
| | | 2 | Ledeno Jezero | 04/08/2015 | 1754 m | 43°35' 17°36' | new field record (leg. et det. S. MERDAN) |
| D | Jahorina | Prača river valley | | 18/08/1921 | *985 m | 43°43' 18°38' | BOLKAY, 1924 |
| E | Ozren | 1 | Vučja Luka (hut Toplica) | 11/07/1919 18/04/1920 | *1200 m | 43°55' 18°31' | BOLKAY, 1929, 1924 |
| | | 2 | Moščanica | 25/09/1919 | *608 m | | 43°51' 18°27' |
| F | Rapte | 1 | Golubinjak | 8/6/1921 | *600 m | 44°21' 18°09' | BOLKAY, 1924 |
| | | 2 | Prosije | 8/6/1920. | 540 m | 44°03' 17°55' | |
| | | 3 | Crni vrh | 8/6/1920 | 800 m | 44°16' 18°16' | |
| | | 4 | Suha rijeka river valley | 27/5/1918 | 440 m | 44°18' 18°08' | BOLKAY, 1924; ZIMIĆ et al., 2013 |
| | | | | 26/9/1920 | *500 m | | BOLKAY, 1919 |
| | | | | 27/5/1919 | 600 m | | |
| 5 | Zlokočke luke | 2/6/1920 | *800 m | 44°25' 18°10' | BOLKAY, 1924 | | |
| | | 9/6/1921 | *800 m | | | | |
| G | Bjelašnica | x | | x | x | 43°41' 18°10' | IZMIRLIJA et al., 2007 |
| H | Zvijezda | Orlja | | 31/3/2014 | 704 m | 44°7' 18°30' | new field record (leg. S. MERDAN, det. A. ZIMIĆ) |
| J | Treskavica | 1 | Veliko jezero | 20/8/2013 | 1582 m | 43°36' 18°23' | new field record (leg et det. E. ŠUNJE) |
| | | 2 | Kozja Luka | aug 1952 | 540 m | 43°32' 18°41' | NMB&H |
| K | Zelengora | Bljušturača – towards Orlovačko jezero | | 2009 | 1557 m | 43°21' 17°32' | new field record (leg. et det. D. JELIĆ) |
| L | Gatačko polje | Gacko | | 1970 | 960 m | 43°10' 18°32' | ARNOLD, 1987 |

* – altitudes subsequently reconstructed based on GoogleEarth platform; **NMB&H** – previously unpublished records from the collection in the NATIONAL MUSEUM OF B&H IN SARAJEVO; **x** – there is no accurate data



Figure 5. *Zootoca vivipara* distribution in B&H (numbers and letters on the map correspond to the numbers and letters in Table 1)

DISCUSSION

To gain an insight into the more complete distribution of the viviparous lizard in B&H, more data is needed. The lack of recent surveys of herpetofauna of B&H leads to poor available data. Since 1889 (when the first *Z. vivipara* record was registered for B&H) until present day, there has been a period of cca 50 years when no data for this species was given (Graph 1). Distribution borders of the species range in B&H are still

tentative. According to distribution of the species in the region (JELIĆ et al., 2012; AGASYAN et al., 2010) we expect that the species distribution range in B&H extends through the whole country excluding the Mediterranean part (Figure 5).

All data suggests that populations in Bosnia and Herzegovina prefer humid habitats and wetlands, and/or high altitude zones (Figures 1 - 4). This specific niche

occupation can be explained by strong competition with other lacertid species which could force *Z. vivipara* to occupy the mentioned adaptive zones. Such places are not suitable for other lacertid species in B&H. Lowland Mediterranean parts of B&H are probably not suitable for viviparous lizard primary because of the strong competition with at least eight true lizard species (ŠUNJE et al., 2014) and/or unsuitable climate.

For now, field research suggests that *Z. vivipara* cannot be found with other true lizard species inhabiting the same microhabitat. The separation of other lacertid species from *Z. vivipara* based on humidity differences between their habitats is also recorded (GLANDT 1976, 1977, 1979; ARNOLD, 1987). Further support for this assumption is that in the northern parts of the Dinarides in B&H the species can be found at lower altitudes (from 440 m a.s.l.) where the competition is much lower [only two lizard species: *Podarcis muralis* (LAURENTI, 1768) and *Lacerta viridis* (LAURENTI, 1768)]. In the subalpine and alpine habitats competition is at the lowest level [only with *Lacerta agilis bosnica* (LINNAEUS, 1758)]. Additionally, viviparous lizard probably has a preference to occupies wet microhabitats where the competition with the related species is lower.

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It is still unclear if populations of *Z. vivipara* of B&H have a continuous or fragmented distribution range with populations of surrounding mountains or countries.

All old records (older than 30 years in Table 1) should be reconfirmed. Anthropogenic pressures on all mountains presented in Table 1, has dramatically increased in the past 15 years due to deforestation and tourism (construction of tourist infrastructure objects – ski resorts, lifts etc.). The impact of these activities on population of *Z. vivipara* is unknown.

On the global scale species is Least Concern – LC (AGASYAN et al., 2009). However, in Croatia viviparous lizard has the status of Data Deficient - DD (JELIĆ et al., 2012), and in Serbia Near Threatened (NT) according to IUCN criteria and Endangered (EN) according to DELH criteria (JOVIĆ & LJUBISAVLJEVIĆ, 2015). B&H has unclear and undefined separate red lists (one for each of the two entities existing within the country – Federation of Bosnia and Herzegovina – FB&H and Republic of Srpska – RS). In FB&H species is listed as LC (ŠKRIJELJ et al., 2013), and in RS is listed without any conservation status. Thus, *Zootoca vivipara* should be considered as species which is Data Deficient (DD) in B&H.

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