

## New record of the common frog *Rana temporaria* (Linnaeus, 1758) indicates the easternmost locality of the species in Bulgaria

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**Abstract.** We present new data on the geographic distribution of the Common Frog (*Rana temporaria*) in Bulgaria. Our dataset results from a six-year monitoring effort conducted in the vicinity of the northern slopes of the Balkan Mountains (Stara Planina Mts.). During field surveys, we identified the presence of 55 adult individuals and specimens in the process of metamorphosis. This article reports the easternmost distribution of *R. temporaria* in Bulgaria and the breeding locality with the lowest altitude in the country and possibly wider southern Balkan range.

**Keywords:** monitoring, amphibian, anuran, migration, field survey, range extension.

### Introduction

The common frog (*Rana temporaria* Linnaeus, 1758) is one of the most widespread amphibians in the Western Palearctic, occupying a wide range of habitats and altitudes throughout Europe except for Mediterranean areas - Portugal, large parts of the Iberian and Apennine peninsulas, and the southern parts on the Balkan Peninsula. East of the Urals, it is found only around the rivers Ob and Irtysh (Grossenbacher 1997, Gasc et al. 2004, Sillero et al. 2014).

Within the territory of Bulgaria, *R. temporaria* inhabits mainly the high mountain regions in the middle mountain belts (Buresh & Tsonkov 1942, Stoyanov 2007). It is often found between 800 and 1000 m a.s.l. or up to 2000–2500 m a.s.l. (Stojanov et al. 2011). The species prefers woodland habitats, occurring in coniferous and deciduous forests, parks, and gardens (Denton 2001). The species is not attached to water but

sticks to moist places, most often near water bodies (Tzankov et al. 2014). *Rana temporaria* breeds in all types of stagnant and moderately flowing water and in various highland habitats above 2300 m a.s.l. in the Rila Mountains (Stojanov et al. 2011).

Amphibians are particularly sensitive to environmental temperature due to their inability to regulate their own body temperature (Tryjanowski et al. 2003, Sparks et al. 2007). Air and water temperature have been proven to interact as interrelated factors impacting egg deposition and development, the onset of hibernation, initiation of reproduction, and other life cycle processes (Beebee 1995, Carey & Alexander 2003, Tryjanowski et al. 2003, Chadwick et al. 2006). Only three spots are known in Bulgaria, where the species was found in the lowlands. One is at 360 m a.s.l. (Beshkov 1988), the second record is between 380–400 m a.s.l. and the third is at 260 m a.s.l. (Stojanov et

al. 2011). The first was recorded during a field study of the migration of *R. temporaria* in the area of the Zelin Resort (Botevgrad town), and the second at an altitude between 380–400 m a.s.l. (a single female specimen and larvae) was recorded in the Kotlenska Planina (Eastern part of Stara Planina Mts.). To date, the lowest known locality of the species in Bulgaria was registered in the spring of 2008 in the Iskar Gorge, near the village of Zverino.

### Material and methods

The population of *R. temporaria* in the “Sofrata” locality and the “Maya dere” site has been an object of monitoring since 2018. Our visits to the study area started in February and ended in the middle of May.

All found specimens were photo-documented using a “Sony RX 100 IV” (Sony Electronics Corporation, Minato, Tokyo, Japan) and a “Panasonic Lumix FZ 200” (Panasonic Corporation, Kadoma, Osaka, Japan). We

recorded the frogs' positions using a handheld GPS system, “Garmin Oregon 600” (Garmin International Inc., Kansas, USA). The datum used to record the geographic coordinates is WGS84. For species identification, we used the identifier book of Stojanov et al. (2011).

### Results

On March 18, 2018, at 12:59 p.m. during a field survey, our team recorded an adult female *R. temporaria* on a dirt road located near the 'Sofrata' area (see Figure 1b), near Veselinovo village (coordinates 42.9480°N, 27.0141°E, 393 m a.s.l.). Approximately 20 meters northwest of the spot was a small reservoir with approximate dimensions of 8 x 3 meters and a depth of up to 50 cm. The water in the reservoir was retained throughout the year; in the summer, its level decreased, but it did not dry up. This location is within the boundaries of the 'Rishki Prohod' SCI Protected Site (BG0000149) of the NATURA 2000 network.

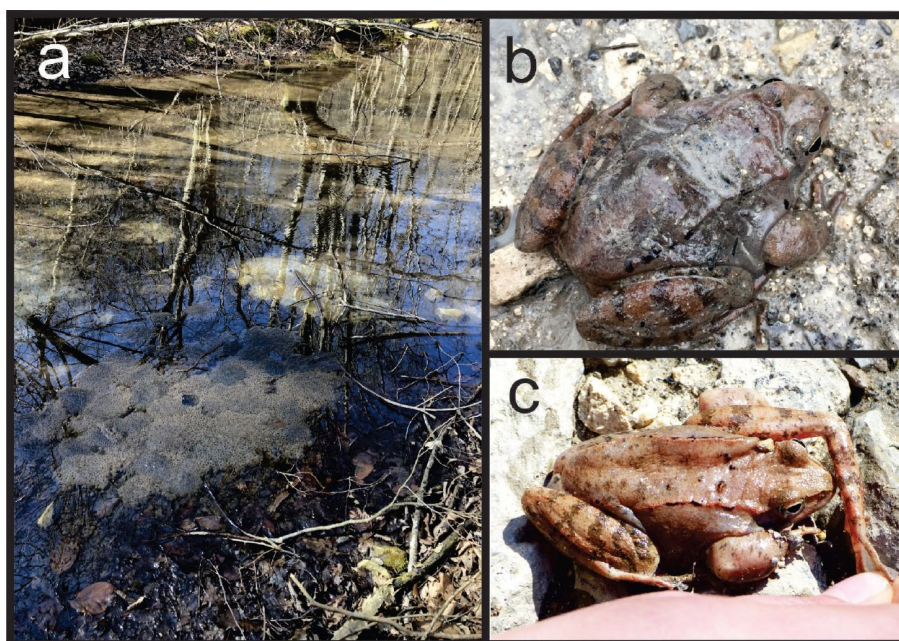


Figure. 1. a) - On 20.03.2020, egg deposits were observed in the “Maya Dere” area. b)- The first observation of an adult female *Rana temporaria* in 2018 in the area of “Sofrata” at the village of Veselinovo. c) – Specimen photo-documented in the “Maya Dere” area on 12.03.2020, Photos by PM.

After six years of monitoring the site, we found a total of 55 adult specimens of *R. temporaria*. The recorded spots are at altitudes ranging from 241 to 393 m above sea level. All observations of adult specimens were made during the breeding season (see Figure 1). Common frogs were found in amplexus in slow-flowing waters with coordinates (42.9718°N, 27.0714°E, 241 m a.s.l.). Egg deposits were also detected in a gorge with steep banks in the 'Maya Dere' area (see Fig. 1a). During the field research, we also recorded the presence of other amphibians: *Rana dalmatina* (Fitzinger in Bonaparte), 1838, *Bufo bufo* (Linnaeus, 1758), *Lissotriton vulgaris* (Linnaeus, 1758), and *Salamandra salamandra* (Linnaeus, 1758). The vegetation in the area is represented by mixed deciduous forests with a predominance of *Quercus cerris* or *Carpinus betulus*.

## Discussion

According to literature data, *R. temporaria* is one of the most widespread amphibians in Europe (see Covaciu-Marcov & Ferenczi 2008). The wide distribution area of *R. temporaria* is a result of the species' high adaptive potential concerning reproduction (Beshkov 1988, Phillimore et al. 2010). On the other hand, the phylogeography of *R. temporaria*, which could help us understand ecological and phenotype variation, is still less explored, especially in the Balkans (see Vences et al. 2013).

In the second half of the 20th century, a rather intriguing migration of the common frog was detected in a locality south of Botevrad (Beshkov & Angelova 1981). The cause of this complex migration is likely associated with climate warming after the last (Würmian) glaciation and specific local conditions. Buresh & Tsonkov (1942) and later Beshkov (1988) suggested that, in the then colder climate, *R. temporaria* inhabited the lowlands of the Balkan Peninsula year-round, as it does today in the lowlands of Central and Northern Europe. According to Stojanov et

al. (2011), in Bulgaria, *R. temporaria* is most often found between 800 and 1000 m a.s.l. The most significant number of *R. temporaria* sightings have been recorded in the deciduous forest belt, grassy habitats, sparsely vegetated terrains, and shrub and grass plant communities (Tzankov et al. 2014). The primary objective of the present study was to confirm the regular presence of the species at a specific site in eastern Bulgaria where altitudes over 800 m a.s.l. are entirely lacking. Probably the reasons the local Common frogs descend at lower altitudes are related to the availability of suitable reservoirs for reproduction in the region, as was the case with some other amphibians, e.g., *Salamandra salamandra* (Jablonski et al. 2013).

In Bulgaria *R. temporaria* overwinters at the bottom of water bodies, but not always in the water body where breeding took place (Beshkov 1988). The presence of this species at low altitudes is a result of migration, which is associated with finding a suitable breeding habitat (river, stream, swamps, puddles, etc.). However, such migrations appear only if water bodies are unavailable in high habitats (Beshkov 1988). The field study of Beshkov and Angelova (1981) presents data on the longest migration of *R. temporaria*. The migration was explained by the lack of breeding sites in the higher parts of the local mountains Beshkov (1988). It is likely that the specimens that we recorded at lower altitudes also migrated for breeding but spent the rest of the active period at higher altitudes. The sites we monitored are about 5 km to 10 km from the highest point in the region (Figure 2). The new locality currently represents the easternmost distribution point and the breeding location with the lowest altitude in Bulgaria. Thus, it represents an important extension of the species' range, documenting the presence of *R. temporaria* in the vicinity of Veselinovo village (Figure 2). The newly discovered population is located about 27 km (Figure 2) from the nearest known locality registered near the village of Kamenko, near Varbitsa town (Popgeorgiev et al. 2015) with coordinates 42.9425°N, 26.7438°E, 424

m a.s.l. Monitoring of *R. temporaria* in the study area continues to establish population stability.

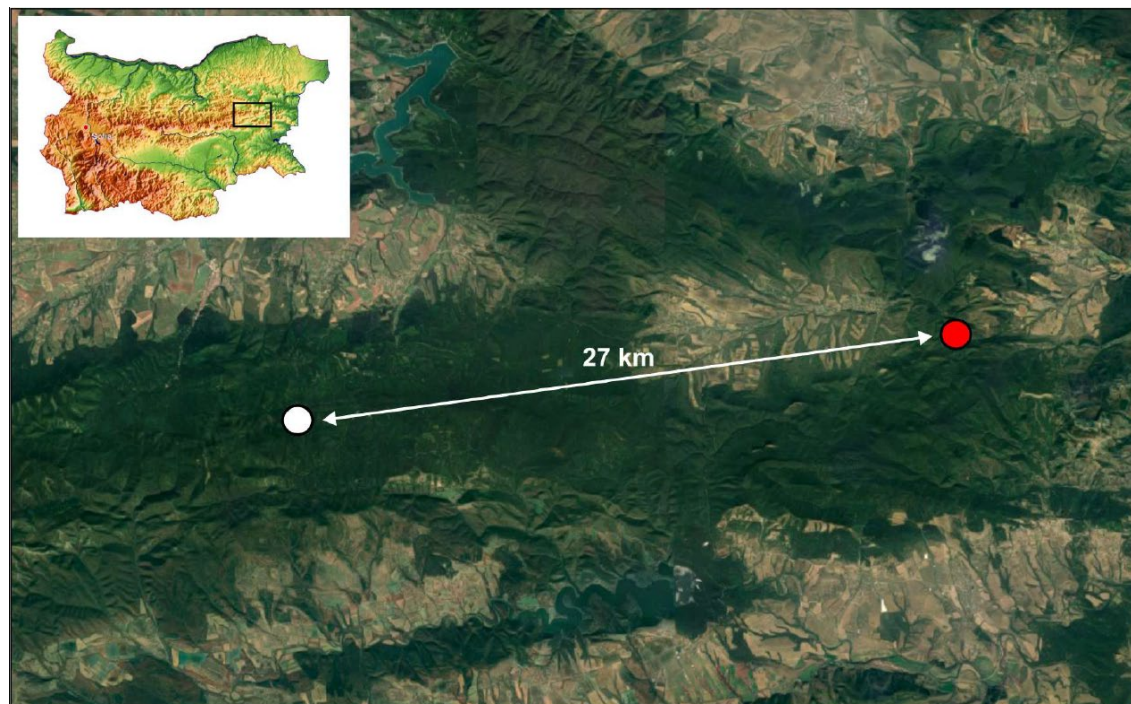


Figure. 2. The nearest previously known population of *R. temporaria* (white dot, near the village of Kamensko near the town of Varbitsa (Popgeorgiev et al. 2015)) and the new, most eastern record located near the village of Veselinovo (red dot).

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