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New locality of *Rana graeca* Boulenger, 1891 and a previously undescribed threat for the species from Western Rhodopes, Bulgaria

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Abstract. A new locality for *Rana graeca* is reported from the Western Rhodopes Mountains. Although the location of the observation falls within the already known range of the species, a newly recorded threat for this and other anuran species is described. In addition habitat characteristics and coordinates are provided.

Key-words: Greek Stream Frog, distribution, conservation.

Introduction

The Greek Stream Frog (*Rana graeca* Boulenger, 1891) is a species of European brown frog endemic to the Balkan Peninsula (Speybroeck *et al.* 2016, Dufresnes *et al.* 2019). This amphibian primarily occupies upland and montane landscapes, where reproductive activity is closely associated with well-oxygenated, fast-flowing freshwater systems – clear streams, springs, and rivers, typically situated within deciduous or mixed forests. The species can be identified by the throat coloration, which is typically marked with dark spotting or marbling. A pale longitudinal stripe runs along the line of the throat and represents a characteristic feature of the species (Stojanov *et al.* 2011).

In Bulgaria, the species inhabits the southwestern regions of the country and extends into various parts of the Rhodope Mountains (Stojanov *et al.* 2011). The distribution of the Greek Stream Frog in the Western Rhodopes was thoroughly studied by Petrov *et al.* (2007).

Materials and Methods

Field observations on amphibians were carried out sporadically during the spring and early summer seasons from 2022 to 2024 in various locations in the Western Rhodope Mts. Geographic coordinates of all observations were documented using GPS devices, and detailed habitat descriptions were recorded directly at each site.

Results and Discussion

A dead individual of the Greek Stream Frog (*Rana graeca*) was found on 19 June 2022 on the trail leading to Slivovdolsko Padalo Waterfall near Bachkovo Village at the following coordinates: N 41.91340, E 24.83853 (Fig. 1). The individual was trampled by the passing tourists recently. The observation was made by I. Mollov on a Sunday, when the tourist flow is extremely high. To our knowledge this is the first observation of a trampled frog by humans. On 14 July 2024, T. Chetalbashev, managed to find and photograph another alive individual at the same locality (Fig. 2). The habitat comprises of a steep trail along the fast-flowing stream with numerous scattered puddles and is surrounded by deciduous vegetation, mostly common beach, as well as mosses covering the rocks and ferns.

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Fig. 1. A dead (trampled) individual of the Greek Stream Frog (*Rana graeca*) from the new locality (Photo: I. Mollov, 19.06.2022).

Fig. 2. Another alive individual of the Greek Stream Frog (*Rana graeca*) from the same locality (Photo: T. Chetalbashev, 14.07.2024).

According to Stojanov *et al.* (2011), based on visual assessments, population density and abundance of *Rana graeca* in Bulgaria have remained relatively stable, although overall population parameters are modest compared with those of many other anuran species. The planned construction of numerous small hydropower plants along streams inhabited by the species poses a potential threat, potentially leading to local declines or extirpations.

Although the effects of roadkill on amphibian populations have been thoroughly studied (Hels & Buchwald 2001; Kambourova-Ivanova *et al.* 2012), often showing that entire local populations of anurans can be destroyed during migrations, very little is known about whether and how direct human disturbance affects populations.

The expansion of tourism and outdoor recreation has emerged as a significant contemporary driver of global biodiversity loss. Projections indicate that human visitation to the world's biodiversity hotspots is expected to increase in the future, thereby intensifying anthropogenic pressure on ecologically sensitive regions (Christ *et al.* 2003). Rodríguez-Prieto & Fernández-Juricic (2005) studied the impact of recreational activities on *Rana iberica*, an endemic and vulnerable amphibian species of the Iberian Peninsula, employing both observational and experimental methodologies. Their results indicated that, at the population scale, frog abundance declined in areas situated closer to sites of recreational use. At the individual level, repeated disturbance events led to behavioral changes, notably prolonging the time required for individuals to resume normal activities following disruption. Kissel *et al.* (2025) state that "direct human disturbance" (walking, tourism, habitat visits) can be a threat to vulnerable amphibians.

Garner *et al.* (2008) studied the impact of human disturbance (human activity, hiking on trails) on the behavior and population density of species from the genus *Arthroleptis* (Smith, 1849) in Africa and found that human activity negatively affects populations and influences their behavior during dispersal and migration.

To our knowledge, no peer-reviewed publications in the searched databases describe a case of a frog trampled by a person as a distinct conservation threat. According to the latest version of the IUCN RedList's Threats Classification Scheme (IUCN 2025), this type of threat falls under number 6 – Human intrusions & disturbance, 6.1 Recreational activities. With the ongoing increase of the human population globally and the increasing recreational visits in mountainous areas in the country (for example, the Vitosha Mts., the Seven Rila lakes, etc.), similar observations are more likely to occur in the future.

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