

## First record of *Podarcis erhardii* (Bedriaga, 1876) from the Bulgarian Black Sea coast, the easternmost locality of the species in the Balkan Peninsula

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Erhard's Wall Lizard, *Podarcis erhardii* (Bedriaga, 1882), is an endemic reptile species of the Balkan Peninsula. It is distributed from southern Serbia through North Macedonia, Albania, southern Bulgaria, and Greece, including the Aegean archipelago. The group of wall lizards of the genus *Podarcis* (Wagler, 1830) in Europe currently consists of more than two dozen recognized species (Speybroeck et al., 2020; Kiourtsoglou et al., 2021). They are all relatively small-sized with a snout–vent length of about 50–80 mm (Arnold et al., 2007). The body length of Erhard's wall lizard is generally about 80 mm, and for Bulgaria the maximum known length is 73 mm (Stojanov et al., 2011). The species is endemic to the southern parts of the Balkans and occurs from sea level to an elevation of 2000 m (Biserkov et al., 2007; Jablonski, 2011; Stojanov et al., 2011; Mizsei et al., 2017). *Podarcis erhardii* is characterized by high morphological, ecological, and genetic variability and can be observed in varying, mostly dry habitats (Poulakakis et al., 2003; Brock et al., 2014).

According to Müller (1933), Erhard's wall lizard was detected for the first time in Bulgarian territory in the regions of Mezek, Svilengrad, and Petrich (Struma Valley, southwestern Bulgaria). More data were provided soon afterwards by Buresh and Tzonkov (1933). To date, the species is known to inhabit mountain valleys and middle-high ridges in the southern and southwestern parts of Bulgaria (Petrov et al., 2001; Beschkov and Nanev 2002; Stojanov et al., 2011; Malakova et al., 2018; Manolev

et al., 2019). Erhard's wall lizard was also observed in suburban habitats (Pulev and Sakelarieva, 2013). The highest recorded elevation for this lizard in Bulgaria is 1600 m at Pirin Mountain (Beschkov, 1961). Activity during the winter months was also recorded (Grozdanov et al., 2016). According to Stojanov et al. (2011), there is a strong distribution gradient of *P. erhardii* in Bulgaria with higher population densities in the southwestern part of the country.

During the period from the end of May to the end of July 2021, we performed field research aiming to update information on amphibian and reptile populations along the Black Sea coast in southeastern Bulgaria. For species identification of the local herpetofauna, we used Stojanov et al. (2011). Animals and ecological or habitat characteristics were documented photographically (Panasonic Lumix DMC-FZ10002 and Lumix DMC-FZ200 cameras; Panasonic Corporation, Osaka, Japan) and their geographic coordinates (WGS84 datum) were obtained using the portable Garmin eTrex 30 GPS (Garmin International Inc., Kansas, USA). Temperature values were obtained using a Thermo Elite 221-061 thermometer (ETI Ltd., Easting Close, Worthing, West Sussex, United Kingdom).

During our field survey on the southern Black Sea coast of Bulgaria, we observed several individuals of *P. erhardii* near the village of Varvara (Fig. 1A; 42.12°N, 27.90°E; elevation 30 m). Our first observation occurred on 29 May 2021 at 11:45 h, when we observed one individual (air temperature 20°C, light cloudiness with a breeze). On 30 July at 11:20 h we detected one male and one female (Fig. 2; air temperature 29°C, sunny with a breeze). The pair (Fig. 2A) was displaying courtship behaviour, but copulation was not observed. The male chased the female and bit her at the base of the right hind leg, held her in position for a short period of time, and released her afterwards.

To date, there had been no observation of *P. erhardii* along the Black Sea coast. Our new record extends the range of the species by approximately 160 km (airline)

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**Figure 1.** (A) Map of the distribution of *Podarcis erhardii*. The red square indicates the newly reported location of the species at the Bulgarian Black Sea coast. (B) The habitat where the population of *P. erhardii* was found. Photo by Teodora Koynova.

eastwards from the nearest previously known locality of the species in Bulgaria, in the region of Mezek (see Petrov et al., 2001; Stojanov et al., 2011), and this is also approximately 130 km farther east than the easternmost known record (Lymberakis et al., 2009). In this area *P. erhardii* probably exist as a very small and possibly vulnerable population that needs further attention, which is why we did not chase, capture, preserve, or otherwise disturb the lizards.

We propose that all three reported individuals belong to the subspecies known from western Bulgaria, *Podarcis erhardii riveti* (Chabanaud, 1919) (Cyren, 1933; Petrov, 2007; Manolev et al., 2019). This subspecies typically has a light brownish dorsal colouration with darker (even black) spots. Towards the tail, the colour (especially in females) may fade and turn into a light yellowish-brown. Females possess a continuous white supraciliary stripe and the subocular stripe is bright, contrasting and extending along the entire length of the body. In both sexes the occipital stripe is relatively short, reaching at most to the middle of the back; dorsal stripes are spot-free. The parietal stripes are well-formed, represented by relatively large black angular spots. Males possess less pronounced supraciliary lines,

composed of individual light spots. The subocular line is difficult to distinguish. The spots from the dorsal and temporal stripes connect in some sectors through the supraciliary lines and give a “ribbed” appearance of the colour (Cyren, 1933; Beshkov and Nanev, 2002; Biserkov et al., 2007; Stojanov et al., 2011).

All of the lizards were observed in a sunny spot on a concrete structure, next to a rocky beach with xerophytic vegetation and a small stream that dries up partially in the summer (Fig. 1B). The habitat is typical for the species (Stojanov et al., 2007; Brock et al., 2014). The species often occurs sympatrically or syntopically with *P. muralis* (Laurenti, 1768) and *P. tauricus* (Pallas, 1814) (Cyren, 1933). In contrast to *P. muralis*, *P. erhardii* prefers horizontal microhabitats with sandy soils. When *P. erhardii* is observed together with *P. tauricus*, it tends to occupy the stony and less grassy areas (Stojanov et al., 2011). In central and southern Greece there are dozens of isolated populations inhabiting different Mediterranean islands, and individuals may differ dramatically in their external morphology (Poulakakis et al., 2005; Roca et al., 2009; Christopoulos, 2018).

The report of Cyren (1933) of 11 specimens from the Strandza Mountains is rather enigmatic, perhaps due to



**Figure 2.** (A) Courting male and female *Podarcis erhardii* near Varvara Village, Burgas, Bulgaria. (B) Adult female *P. muralis* from Ropotamo Burgas, Bulgaria to allow comparison of phenotypes between both species. Photos by Stoyan Mihov (A) and Daniel Jablonski (B).

a mix-up of the phenotypes of *P. muralis* and *P. erhardii*. The latter does resemble *P. muralis* in dorsal and lateral perspective (Fig. 2B), and the common wall lizard is abundant along the Bulgarian Black Sea coast. Due to habitat sharing and morphological similarity with *P. muralis*, it is possible that the population of *P. erhardii* at the Black Sea coast is not new but may simply have been overlooked for a long time. To date, Erhard's wall lizard has never been reported from Turkey (see Lymberakis et al., 2009), whose borders are very close to the new locality of *P. erhardii*. Further research is needed to clarify whether the species can be detected elsewhere along the Black Sea coast.

The new locality currently represents the easternmost record for this species in the Balkan Peninsula and the only one on the Black Sea coast. Thus, it represents an important range extension, documenting that *P. erhardii* is present on both the western and eastern coasts of the Balkan Peninsula. Despite the fact that the Black Sea coast is often visited by professional and amateur

reptile observers, a detailed study on the distribution and ecological niche of *P. erhardii* populations along the Black Sea coast is needed. Anthropogenic influence on the introduction of these lizards cannot be fully ruled out, given that this newly discovered population was found in the vicinity of a tourist village with intensive construction activities and material transportation. However, having in mind the geographic profile of the nearest known natural populations, this assumption is difficult to be verified. Thus, additional research, with the inclusion of molecular evidence, is needed.

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