

# Up in the mountains: a new record of the Yellow-bellied Toad, *Bombina variegata* (Linnaeus, 1758), fills a missing piece of the biogeographical puzzle in central Euboea, Greece

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The Yellow-bellied Toad (*Bombina variegata*) is a widespread European toad species (Speybroeck et al., 2016). In the Balkan Peninsula, the species is found mainly in mountainous regions, and its range includes much of mainland Greece, excluding the Peloponnese (Valakos et al., 2008; Pafilis and Maragou, 2020) (Fig. 1). The only insular populations of *B. variegata* known so far, on Paros and Euboea, mark the southernmost extent of the species' range (Fig. 1). Whereas the population on Paros is considered introduced (Troidl and Troidl, 2019; Tzoras et al., 2023), the Euboean population has been considered a remnant of an historically continuous distribution (Pafilis and Kapsalas, 2024), dating back to when Euboea was still connected to the mainland, around 5000 years ago (Mariolakos and Bantekas, 2002).

Euboea is the second-largest island of Greece and the sixth largest in the Mediterranean Sea, with an area of 3684 km<sup>2</sup>, yet its fauna remains largely unexplored from a scientific perspective. In the last five years, several new records of animal species have been documented, which have helped to improve our understanding of the biogeographical history of the island (Christopoulos et al., 2019; Karaouzas et al., 2022; Strachinis, 2021; Danelis, 2024; Pafilis and Kapsalas, 2024). The presence of Yellow-bellied Toads on Euboea was confirmed only recently, from a single fountain in the southern part of the island (Fig. 1), but this raised questions about the species' presence elsewhere on the island (Pafilis and Kapsalas, 2024).

The aim of this study was to investigate the possible presence of the Yellow-bellied Toads in central Euboea,

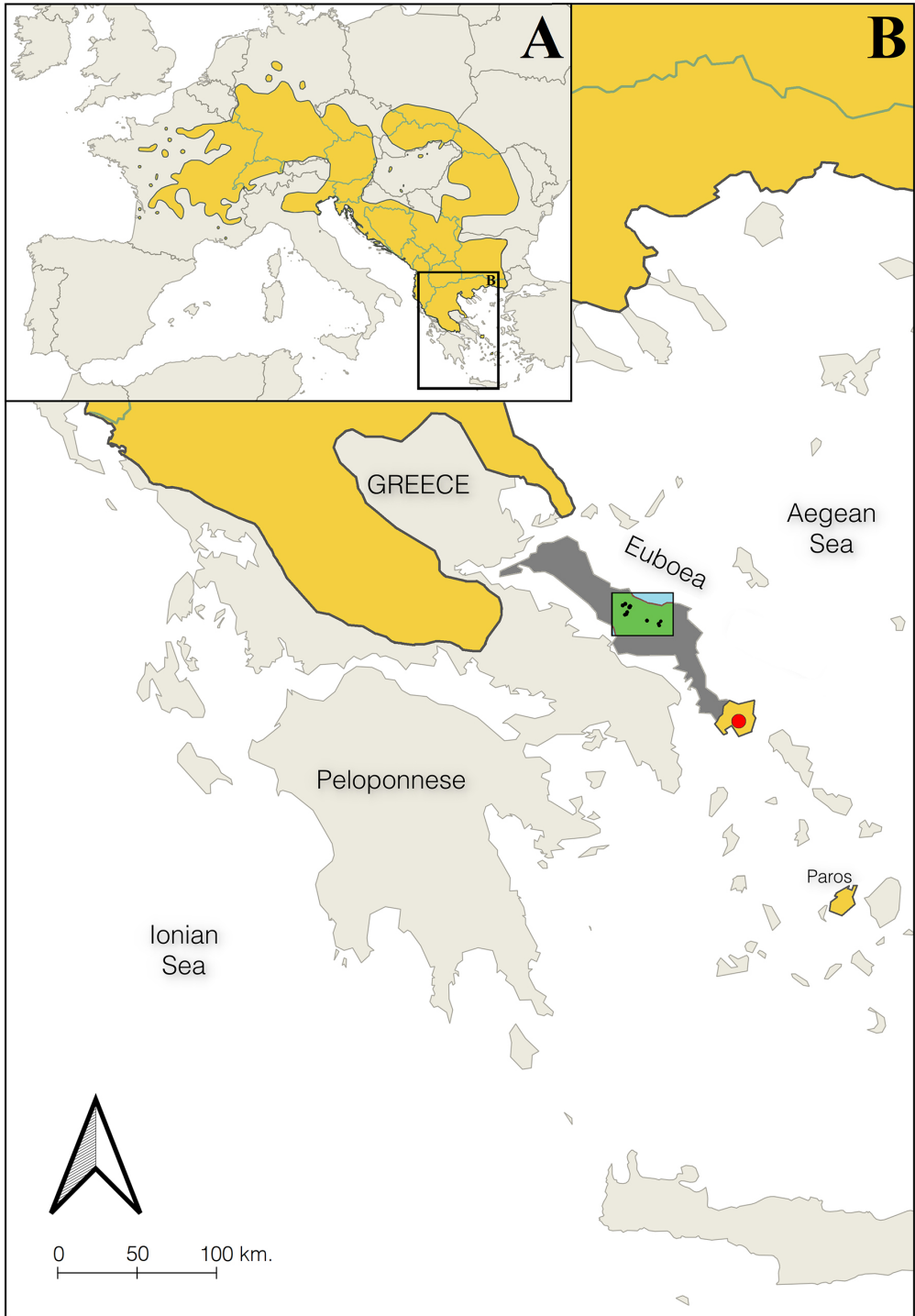
and our field survey took place in June 2025. We focused on less-studied mountainous areas, in particular on 14 waterbodies of mainly stagnant waters and slow streams (Fig. 2). In Greece, *B. variegata* prefers ponds and puddles as habitats during the breeding season, when dense breeding populations are formed (Valakos et al., 2008). We obtained our records through both visual encounter surveys and dip-net sampling.

Despite the wide coverage area of our study, we found only one additional site with *B. variegata* (38.5836°N, 23.9370°E; elevation 1019 m). This is a breeding population with numerous individuals of both sexes and tadpoles on the southern slopes of Mt. Xerovouni on the Seta Plateau (Fig. 2). The pond is artificial in its origin but has become fully naturalized (Fig. 3A). In the same pond we also detected larval and metamorphosed juvenile Fire Salamanders (*Salamanca salamandra*) and one adult and tadpoles of the Common Toad (*Bufo bufo*). A Grass Snake (*Natrix natrix*) was also observed, which is a potential predator of the toads (Gregory and Isaac, 2004; Maxinová et al., 2018; Łaciak et al., 2023). Three additional individuals were found in a wheel rut close to the pond (Fig. 3A inset). The recorded population lies within the NATURA 2000 Site GR2420011 – Special Protected Area “Ori Kentrikis Evvoias”.

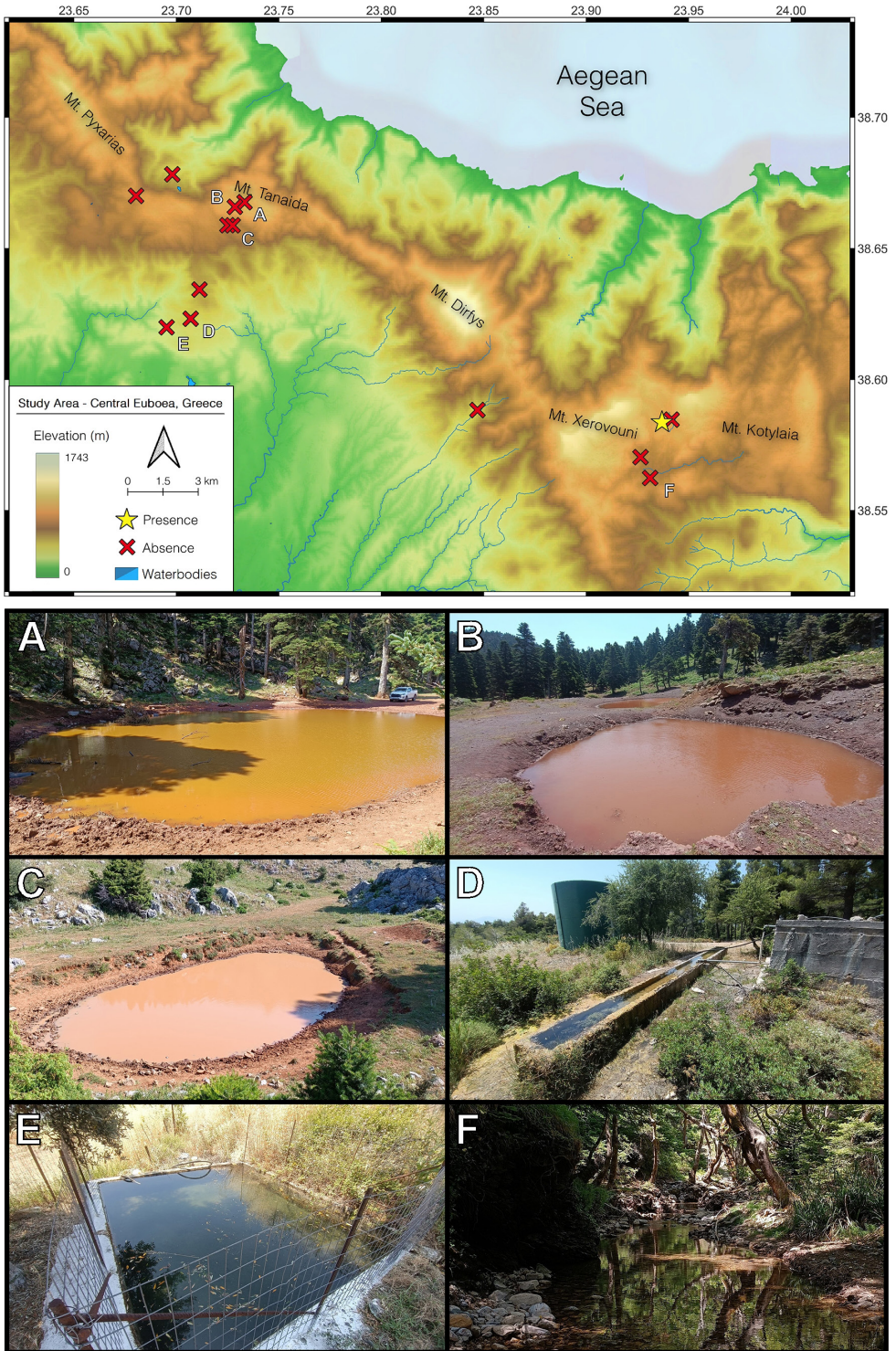
This record represents the second known population on the island, with the nearest population located 73.5 km to the southeast on Mt. Ochi in southern Euboea (Pafilis and Kapsalas, 2024). Even though the phylogenetic position of these populations is still unknown, the biogeography of the Yellow-bellied Toad (Hofman et al., 2007; Fijarczyk et al., 2011; Dufresnes et al., 2025) suggests that both should be considered part of *B. variegata scabra* (Küster, 1843). Also, given the absence of suitable habitats in the intervening parts of the island, these two populations should be regarded as separate, isolated, and peripheral, occurring at the southern edge of the species' range (Lesica and Allendorf, 1995).

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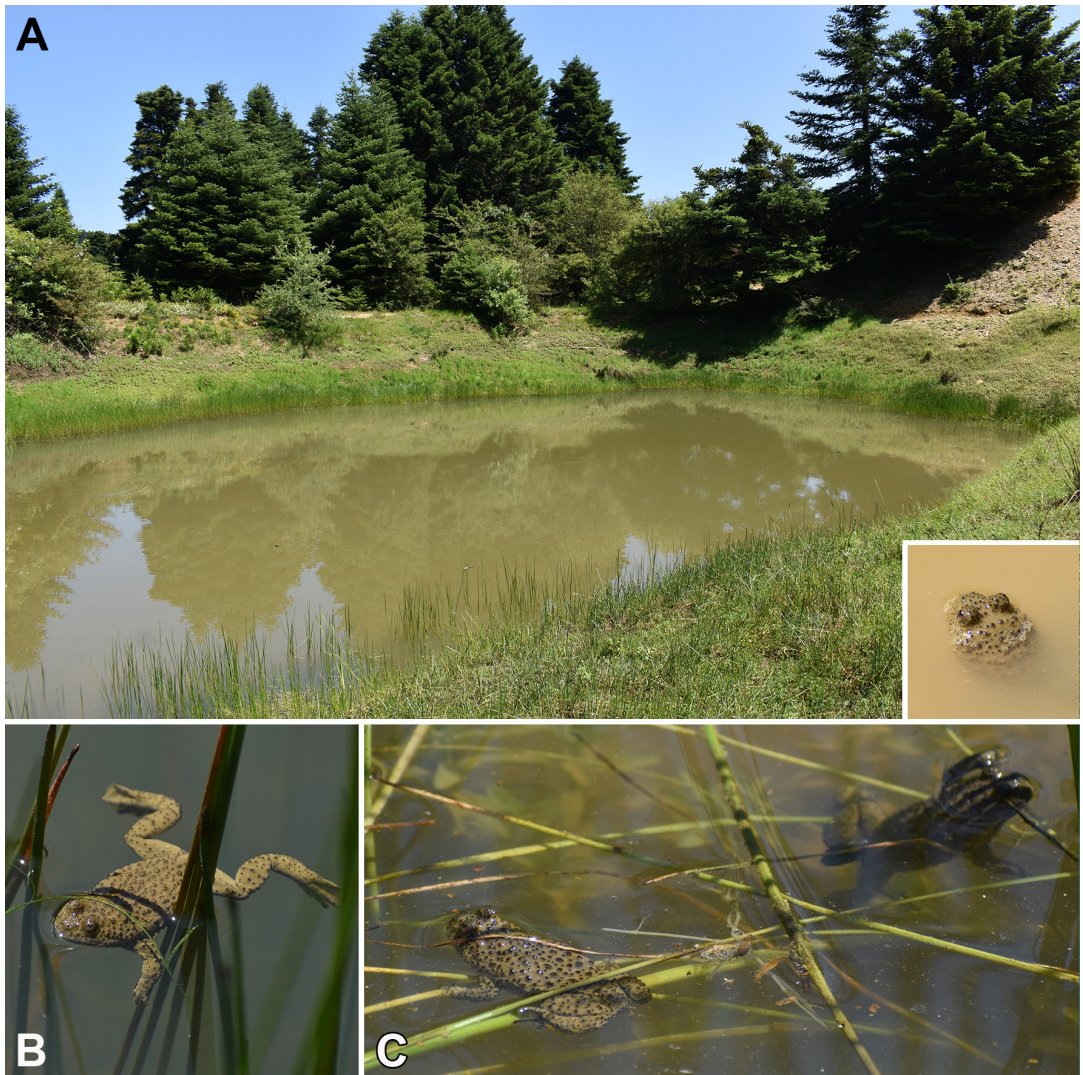
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**Figure 1.** Range of the Yellow-bellied toad, *Bombina variegata* (yellow shading). (A) European range. (B) Zoomed-in view of the range in Greece. Euboea Island is shown in dark grey. The red circle marks the population on Mt. Ochi in southern Euboea, while the coloured square with black marks indicates the study area and the sampled localities. The map was constructed based on recent publications (Pafilis and Maragou, 2020; Ogradowczyk et al., 2022; Dufresnes et al., 2025). Please consider that the real distribution is less continuous than depicted.



**Figure 2.** Topographic map of the study area in central Euboea, Greece, corresponding to the rectangle shown in Fig. 1. Surveyed waterbodies are marked, with presence (yellow star) and absence (red cross) of Yellow-bellied Toads (*Bombina variegata*) indicated. Letters indicate the specific localities pictured below. (A–C) Dugout farm ponds. (D) Drinking trough. (E) Traditional cistern. (F) Stream pool. Photos by Taxiarchis Danelis.



**Figure 3.** Breeding site of the Yellow-bellied toad, *Bombina variegata*, on the Seta Plateau, in Central Euboea, Greece. (A) General view of the pond. The inset shows a toad found in a wheel rut close to the pond. (B, C) Toads observed in the pond. Photos by Taxiarchis Danelis.

Further fieldwork is needed to investigate other localities on the island, particularly in northern Euboea, where habitats seem to be more suitable (coniferous forests with temporary and/or permanent waterbodies; Valakos et al., 2008). Furthermore, modern techniques and tools, such as the collection of environmental DNA, might provide additional insights in terms of biodiversity (Evans and Lamberti, 2018; Mauvisseau et al., 2019). Under the pressure of climate change and habitat fragmentation (Ogrodowczyk et al. 2022; Hantzschnmann et al. 2021), conservation of these

populations is essential (Hoff et al., 2025). Considering that the Yellow-bellied Toad is a priority species listed in Annex II of the EU Habitats Directive 92/43/EEC, the designation of a Special Area of Conservation (SAC) should be pursued in the area.

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