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A new maximum size for female Common Toads, *Bufo bufo* (Linnaeus, 1758), from Poland

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The Common Toad, *Bufo bufo* (Linnaeus, 1758), is a widespread amphibian found across much of Central and Eastern Europe (from Greece in the south to Norway in the north) and eastward into Asia, where its range reaches Xinjiang (China), north Kazakhstan, and eastern Siberia (Speybroeck et al., 2016). In Poland, it is one of three species of *Bufonidae* and, after the Marsh Frog, *Pelophylax ridibundus* (Pallas, 1771), the largest anuran species (Berger, 2000; Kaczmarski and Knioła, 2016).

Golęciński Pond (0.89 ha; 52.2548°N, 16.5317°E, elevation 77 m), is a known a breeding site for the Common Toad and is located in northwestern Poznań. The pond is surrounded by a narrow belt of reedbed (mainly *Phragmites australis*) and riparian vegetation of deciduous trees and shrubs. A coniferous forest, which likely serves as a foraging and hibernation area for this *B. bufo* population, lies to the west of the pond. The pond is separated from this forest habitat by two-line railway tracks and Warmińska Street. A concrete footbridge over the railway tracks has been documented as a crossing point for toads migrating between these two habitats (Fig. 1).

On 26 March 2025, adjacent to the footbridge on the forest edge (52.2546°N, 16.5308°E, elevation 84 m), a female *B. bufo* with a snout-vent length (SVL) of 130 mm and a weight of 203.3 grams (measured prior to egg deposition) was found (measured using a caliper and two types of scales: a jeweler's weight scale and a Pesola scale; Fig. 2). The specimen was found *in amplexus* with a male measuring 76 mm (SVL). Within an ongoing mortality mitigation study for the Warmińska Street road, the most frequent female size classes were 95.1–100.0 mm in 2019 (largest female also in class 95-100 mm) and 100.1–105.0 mm in 2020 (largest female in class 110-115 mm) (n = 51, unpublished data). Thus, the specimen reported herein (130 mm SVL) represents the largest *B. bufo* observed in the study site to date.

Based on the available literature, this appears to be the largest measured specimen of *B. bufo* recorded in Poland. *Bufo bufo* follows a pattern seen in most anurans, with females being larger than males. Some authors mention a maximum length of up to 200 mm (e.g., Klimaszewski, 2023), but without providing a specific locality or verifiable source. The widely accepted upper size limit for the *B. bufo* in Poland is 125 mm (Juszczyk, 1987; Berger, 2000). Data from documented Polish populations report even smaller maximum size, for example: 105 mm (Wojdan, 2014), 96 mm (Łaciak and Łaciak, 2014) and 98 mm (Formicki et al., 2011). In other parts of its range, reported maximum sizes are similar; for example, a maximum of 120 mm is report from the Czech Republic (Baruš and Oliva, 1992). Trochet et al. (2014), in a large database of European amphibian traits, report an average female SVL of 84.36 mm but do not provide a maximum value.

Several modern field guides and syntheses cite higher potential maxima. Dufresnes (2019) gives a maximum SVL of 150 mm for female *B. bufo*, while noting that the closely related Spiny Toad (*Bufo spinosus*; formerly considered a subspecies) from southwestern Europe and North Africa can reach 180 mm. Similarly, Arnold and Ovenden (2002) and Speybroeck et al. (2016) cite upper limits of 150 mm and 180 mm, respectively, for the "common toad", without explicitly delimiting subspecies. Speybroeck et al. (2016) emphasise that such large individuals occur mainly in the southern part of the range, whereas northern populations typically do not exceed 110 mm. This latitudinal gradient is supported by Kwet (2022), who notes that *B. bufo* in southern regions (e.g., Italy, Greece) can measure up to 180 mm, though most individuals do not exceed 120 mm.

Regarding weight, Trochet et al. (2014) state 164.75 grams as the average body mass of adult female *B. bufo*.

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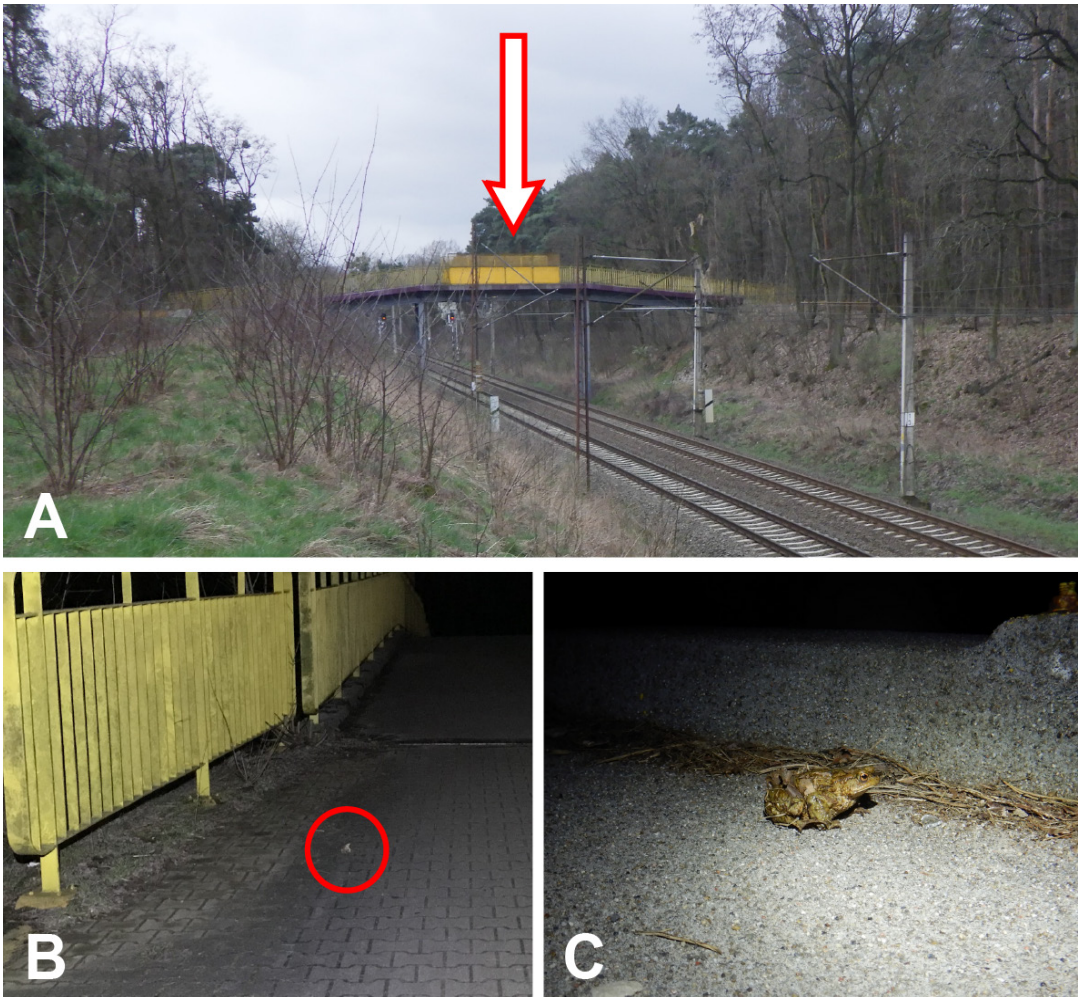

Figure 1. Documentation of the observation site of a female Common Toad (*Bufo bufo*) on a railway overpass that connects the breeding site with the forest complex, from which adult individuals migrate in spring. (A) General view of the overpass. The arrow indicates the location of an example individual from the lower panel. (B) A male (circled) waiting at the entrance leading onto the overpass. (C) An example male moving along the edge of the overpass, at the location indicated by the arrow in panel A.

In Poland, Juszczyk (1987), Wojdan (2014), Łaciak and Łaciak (2014) report individuals weighing 155.5 g, 124 g, and 89.6 g, respectively, as the biggest encounters during their studies, with measurements being taken prior to egg deposition. In other parts of its range, such as Romania (Hartel and Demeter, 2005) and Great Britain (Cattel, 2015) weights of 88.53 g and 45.3 g, respectively, were reported as the average body mass of female *B. bufo*. Compared to these reports, this makes the here reported specimen from Warmińska Street, at 203.3 grams, notably heavier.

Amphibian body length and mass are strongly dependent on environmental factors and individual predisposition (Hemelaar, 1986; Reading, 1991), and even size at metamorphosis that can be influenced by many variables such as temperature (Reading, 2010, Ujszegi et al., 2022). Amphibians show a rapid growth rate up to the age of first breeding (Hota, 1994). Thereafter, the rate of growth slows considerably. Age and size are positively correlated, although the correlation is quite weak (Halliday and Verrell, 1998). Additionally, there is substantial variance in body size among individuals of the same age group. Female fecundity is positively correlated with size, but not with

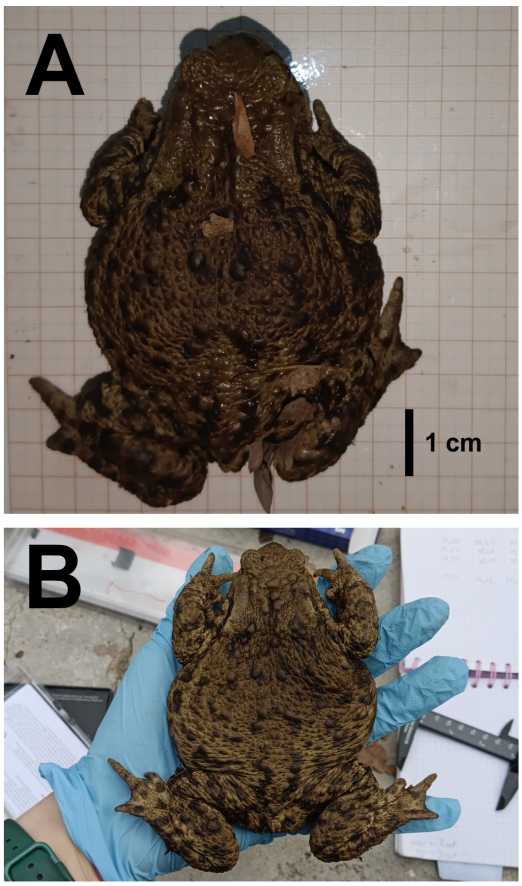

Figure 2. Female Common Toad from Warmińska Street on plotting paper, with each larger square measuring 1 cm (A), and on a researcher's hand (B).

age (Tomasevic et al., 2008). Therefore, parameters such as size should not be used to estimate precise age. Studies using skeletochronology are most reliable when estimating individual age (Ogielska, 2006). Kolenda et al. (2018) while using this method on road killed and live toads revealed that the age of migrating toads varied between 3 and 10 years old.

Multiple factors influence amphibian body size during both larval and post-metamorphic stages (Werner, 1986; Morrison and Hero, 2003; Indermaur et al., 2010; Johnson et al., 2023). *Bufo bufo* generally exhibits a converse Bergmann cline, with body size increasing at lower latitudes (Cvetković et al., 2009). This pattern is likely driven by longer activity periods, greater food availability, and higher temperatures in the southern parts of its range. Following this logic, one might predict that size would increase with global warming. However, a 37-year study from England reports the opposite trend (Reading and Jofré, 2021). With an average temperature increase of 1.3 °C, a decrease in length, weight, and scaled mass index was observed in both sexes. Reading and Jofré (2021) interpret this as a plastic phenotypic response to climate change rather than an evolutionary adaptation.

The role of landscape structure in shaping morphology via phenotypic plasticity is also evident, though findings are inconsistent. Guillot et al. (2016) reported that *B. bufo* from open landscapes (farmland and hedgerows) were larger and heavier than those from forests. In contrast, Bettencourt-Amarante et al. (2025) found that *B. bufo* in more natural environments were larger compared to those in human-modified habitats.

A long-term study on the Fowler's Toad, *Anaxyrus fowleri* (Hinckley, 1882), in Ontario, Canada, suggests a different primary driver (Green and Middleton, 2013). Over 23 years, body size variation was negatively correlated with population abundance, pointing to food availability as a key limiting factor, while no direct link was found between increasing temperature and snout-vent length.

Collectively, the above studies highlight the complexity and context-dependency of processes governing growth and body size in the *B. bufo*. This underscores the need for caution when extrapolating results between populations and emphasises the critical importance of long-term, local monitoring. The record-breaking *B. bufo* specimen reported in this study is notable. However, as a single individual, it allows for only limited conclusions based on the available data. Nevertheless, comprehensive morphometric data for many populations appear to be underrepresented in the literature.

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