

Winter activity of the smooth newt *Lissotriton vulgaris* in Central Europe

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Climate change deeply affects animal phenology. This is especially true for poikilothermic animals such as amphibians (Beebee et al., 2002; Walther et al., 2002; Root et al., 2003; Corn, 2005). In the global context, both anurans and urodeles now tend to begin their spring migration earlier than in the past (Gibbs et al., 2001; Chadwick et al., 2006; Ge et al., 2015; Todd et al., 2011). In Europe, such changes in phenology are relatively easy to detect among explosively-breeding species such as the common frog *Rana temporaria* or the common toad *Bufo bufo* (Tryjanowski et al., 2003; Carroll et al., 2009; Neveu, 2009; but see Beebee et al., 2002). In contrast, much less is known about changes in the phenology of small and secretive species, such as the smooth newt *Lissotriton vulgaris* (but see Chadwick et al., 2006; Jablonski, 2013). In the temperate oceanic climate of western Europe, the species is known to begin breeding migration as early as January, with a long-term trend towards earlier onset of migration (Chadwick et al., 2006). In some cases, animals may remain active throughout the year (Bell, 1977). In contrast, in the continental climate of central and eastern Europe, *L. vulgaris* usually hibernates on land between November and March (Kowalewski, 1974; Juszczyk, 1987; Baruš & Oliva, 1992). Moreover, no long-term data on phenological changes are available for the species. However, as amphibians at similar latitudes adjust their phenology to temperature in analogous ways (Sparks et al., 2007), records of winter activity of newts are expected to occur more often not only in Western Europe (Chadwick et al., 2006), but also in the eastern part of the continent (Jablonski, 2013). Here we report unusual winter activity of *L. vulgaris* in a lowland population in western Poland.

In 2014, we initiated monitoring of a *L. vulgaris* population located in an urban park, 'Traszki Ratajskie' (16°58'29" N; 52°23'32" E) in the centre of the city of Poznań (ca 540,000 inhabitants). Individuals from this population breed in two small ponds located in the park and hibernate in an embankment adjoining tram tracks bordering the park (for more details on the population studied, see Kaczmarski & Kaczmarek, 2016). From 2014 to 2018, between December and January, we made several opportunistic observations on winter activity of newts. Observations were performed after dusk, exclusively on days characterised by high humidity and temperatures over 5°C (in the studied area, the mean daytime temperature in December and January is 0.2°C and -0.8°C, respectively;

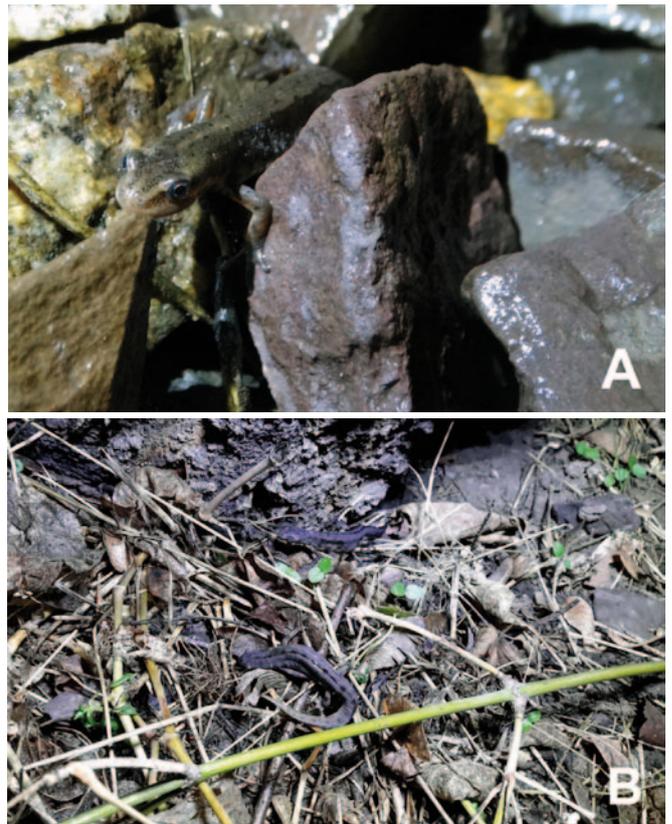


Figure 1. (A) A male smooth newt *L. vulgaris* active on a stone embankment near tram tracks on 29 January 2018 (B) Two *L. vulgaris* males active on land on 19 December 2018, Poznań municipality, western Poland

data for 1981–2010). The transect we used was located along a tram track, which, for the studied population, serves as a terrestrial habitat as well as a hibernation site (Kaczmarski & Kaczmarek, 2016). Air temperature and humidity were measured at the beginning of each observation using a CEM TH321-S thermohygrometer. Animal handling was performed according to guidelines from local conservation authorities (permit no. WPN-II.6401.190.2016.AC.2)

In the course of two midwinter observations, we found active individuals of *L. vulgaris*. On 19 December 2014, we found 6 active animals (3 females and 3 males; air temperature 11°C, humidity 93%). On 29 January 2018, we observed 5 newts active on the ground (3 females and 2 males; air temperature 9°C, humidity 100%). Newts

were observed on open ground (i.e. without vegetation) of stone aggregate (Fig. 1A), between stones, and on soil under trees planted on the slope of the embankment. No individuals were found on the park trails between the embankment and the breeding ponds, where substantial mortality occurs during the spring and autumn migration (Kaczmarski & Kaczmarek, 2013). Two males in 2014 and one in 2018 exhibited traces of mating colouration and crest development (Fig. 1B).

The results of our observations show that, in central Europe, *L. vulgaris* is able to engage in winter activity during mild weather. December migration into ponds by some individuals is known from western Europe (Bell, 1977); however, to date, such activity has been seldom reported from central and eastern Europe, probably due to this region's more severe climate (Jablonski, 2013). Published observations of winter activity of *L. vulgaris* in Slovakia concerned only males and were described as very early spring migration attempts, as males move to breeding ponds earlier than females (Jablonski, 2013). In our population, we found both adult males and females during our winter observations, and only three males showed any signs of breeding colouration. Additionally, all of the individuals observed were found in a terrestrial habitat where newts were abundant during autumn surveys (Kaczmarski & Kaczmarek, 2016).

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