

## Partial neoteny in the northern spectacled salamander *Salamandrina perspicillata*

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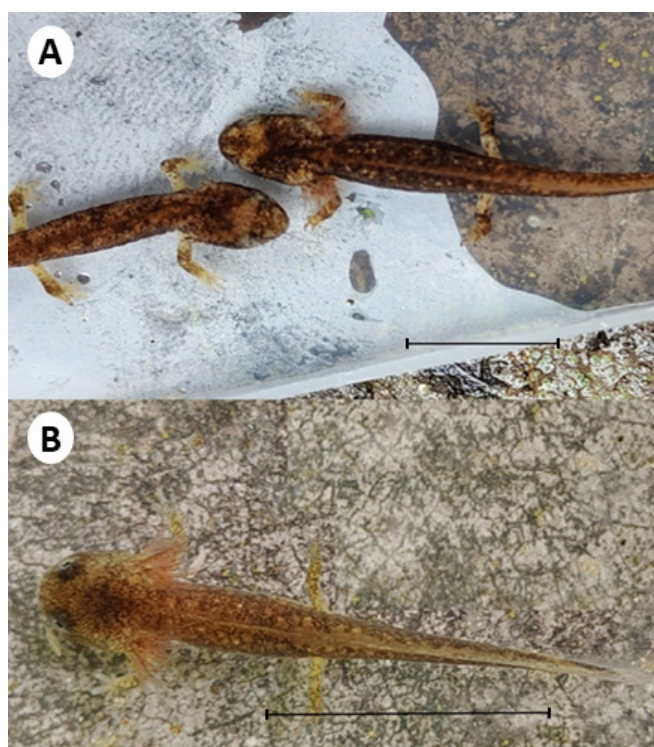
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We report here potential cases of partial neoteny in a population of the northern spectacled salamander *Salamandrina perspicillata*. The term neoteny was introduced by Kollmann (1885) to describe the retardation of physiological development during the larval stage of amphibians (Gould, 1977). According to Lanza et al. (2007) there are at least three different forms of neoteny: i) full - larvae never undergo metamorphosis; ii) almost full - larvae can reach a rather large size and can also reach sexual maturity, remaining more or less as such for a long time; iii) partial - partial neoteny occurs when metamorphosis is delayed due to temporary ecological changes in the environment, without larvae developing sexual maturity.

*Salamandrina perspicillata* is a tiny salamander (total length: 70–100 mm) endemic to the central and northern areas of the Italian Peninsula (Amgelini et al., 2007; Di Nicola et al., 2019). At hatching, the length of larvae is 7–13 mm (Vanni, 1981) and metamorphosis is completed in 2–4 months, depending on water temperature, food availability and other ecological factors (Della Rocca et al., 2005; Angelini et al., 2008).

During a field survey of the herpetological fauna of the Reatini mountains (north-eastern Latium, central Italy) ten large larvae of *S. perspicillata* in an advanced stage of development (four limbs, evident dorsal pattern, well developed spot in the shape of ‘spectacles’ on head typical for the species, Fig. 1A) were observed during two research visits (11 and 19 July 2024), in a large drinking trough fed by a spring located at 1,135 m a.s.l., in the municipality of Vazia (Province of Rieti, Latium, central Italy). The total length of these larvae ranged from 34 to 48 mm. This exceeds the total length normally attained by pre-metamorphic larvae of the species (17.7–23.4 mm according to Angelini et al., 2008) by a large margin, and would even be considered long when compared to metamorphosed larvae at the end of their first year of terrestrial life, which may measure 25–30 mm length (Vanni, 1981; Angelini et al., 2008). The remarkable size of the observed larvae indicates that they have had a long larval stage, and that they probably hatched in early autumn 2023, thus far exceeding the time normally required for metamorphosis in the species (2–4 months). In our opinion this can be considered as a case of partial neoteny. To date the only known case of neoteny (partial neoteny) for the species is that recorded by Filippi et al. (2020) in a drinking



**Figure 1.** Larvae of *Salamandrina perspicillata* from the study site - **A.** Two large-sized neotenic larvae, **B.** Medium-sized normal larva (scale bars- 1 cm)

trough sited in the Valle del Treja Regional Park (Province of Viterbo, Latium, central Italy). However, Filippi et al. (2020) observed only one neotenic individual, a leucistic larva with a total length of ca. 50 mm. Cases of full neoteny or almost full neoteny have never been recorded for the species.

At the same study site and on the same dates, 25 small larvae (10–12 mm, first stage of growth, no limbs) and 16 medium sized larvae (18–20 mm, well developed fore and hind limbs, Fig. 1B) of *S. perspicillata* were also observed. This suggests to us that the local population of *S. perspicillata* is characterised by different breeding periods, and that females living in the study site can lay eggs either in autumn or in winter and springtime. After collection, all individuals were measured, photographed and immediately released where they were collected.

In central Italy, the oviposition period of *S. perspicillata* normally extends from February to May (Della Rocca et al., 2005), though adult females of some populations from southern Latium (Lepini mountains) are known to lay eggs also in autumn and winter (Corsetti, 1999). However, it must be stressed that climate, altitude and habitat characteristics of the study site are very different from those of the southern Latium sites, which are about 200 km from the Reatini mountains. In fact, the altitude of the study site is one of the highest among those known for *S. perspicillata* in central Italy (Bologna et al., 2000). The study site lies in a mountainous area of the central Apennines characterised by temperate climate and beech forests, while the southern Latium sites lie at lower altitudes and are characterised by a Mediterranean climate, Mediterranean scrub and holm oak woods. It seems likely that the wide egg-laying period is linked to still unknown ecological and population biology factors rather than to either climatic factors (e.g. late spring-summer drought, maximum rainfall in autumn and winter) or altitude as previously suggested by Corsetti (1999) and Angelini et al. (2007; 2008).

## ACKNOWLEDGEMENTS

The authors are indebted to Klaus Henle for reviewing the manuscript.

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Accepted: 19 September 2024