

## Rapid colour change in the agile frog *Rana dalmatina* in north-west Italy

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The agile frog, *Rana dalmatina* Fitzinger 1838, is widely distributed in western, central and south-eastern Europe (Speybroeck et al., 2016). It lives mainly in deciduous and mixed forests and adjacent meadows. The colouration of this slender and long-legged ranid is generally uniform brown, light brown or beige above, often reddish or yellowish, with a few darker markings.

On 27 July 2021, during a visit in a forest near Lago di Viverone, Piedmont, in north-western Italy (45° 24'46" N, 8° 1'11" E, 235 m a.s.l.) the author captured three adult *R. dalmatina* with blackish brown markings. These were placed temporarily in plastic bags. After about 30–45 minutes, I came to photograph and release them and to my surprise they had turned much lighter; basically to a colouration that I consider normal throughout their distribution. On 28 July, I found yet another adult (SVL 46 mm) that was also very dark. Hence, I photographed it approx. 30 seconds after capture (10:33 h), as it still had its conspicuous dark colouration (Fig. 1). The dorsum and body sides were dark brown with blackish brown blotches and two cream-coloured dorsolateral ridges with black markings anteriorly. The individual was placed in a transparent plastic bag, then in my backpack. At 54 minutes later (11:27 h) it was photographed again when it appeared much lighter (Fig. 2); much the same light colour as the three individuals the day before. The dorsum and upper body sides were light brown and nearly uniform, except for the two dorsolateral ridges which were basically the same as when the frog was found initially. The brown blotches on the lower body sides had turned lighter. In both Figures 1 and 2 there are small, nearly black remains of dead leaves on the frog. All four frogs were released after I had photographed them.

The habitat consisted of dense deciduous forest with a moist substrate of nearly black soil. Over decades, I have observed *R. dalmatina* in most of its European distribution (though by far most in Denmark), but I have never observed such dark individuals. However, once the frogs had been removed from their habitat and put in plastic bags for half an hour to an hour, their colouration corresponded well with my general experience with *R. dalmatina*.

Kang et al. (2016) observed rapid colour change, i.e., occurring within an hour, in *Hyla japonica*, apparently with the purpose of resembling natural backgrounds. Similar results were achieved in *Dryophytes cinereus* and *Pseudacris crucifer* concluding that colour change might enhance crypticity and function in predator avoidance, but it was also linked to changing temperatures (Kats & Van Dragt,



**Figure 1.** Very dark Italian *Rana dalmatina* photographed on 28 July 2021 at 10:33 h, immediately after capture



**Figure 2.** The same *Rana dalmatina* as in Fig. 1, but photographed 54 minutes later after having been kept in a plastic bag in the dark of a backpack

1986; King et al., 1994). The potential role of stress as the agile frogs were handled and subsequently spent 30–55 minutes in a plastic bag should also be considered. However, the general effect of stress on colouration is that frogs turn darker due to the darkening agent  $\alpha$ -melanocyte stimulating hormone ( $\alpha$ -MSH) (Isoldi et al., 2010; Bringsøe, 2020). As the four *R. dalmatina* in this case turned markedly lighter, I find it likely that the change was not caused by stress. An unusual colour change in a close relative was observed as *R. graeca* in

Albania turned bright yellow at night whereas the frogs had their normal brown colouration during the day (Bringsøe, 2011). To my knowledge, this is the first report of rapid colour change in *R. dalmatina*.

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