A case of hypopigmentation in a *Triturus marmoratus* from Burgos (Spain)

Adrián Talavera* & Bernat Burriel-Carranza

Instituto de Biología Evolutiva (UPF-CSIC). Passeig de la Barceloneta, 37-39. 08003 Barcelona. Spain. *C.e.: adrian.talavera@csic.es

Fecha de aceptación: 28 de abril de 2021 .
Key words: amphibian, Burgos, color aberration, hypopigmentation, Marbled newt.

Resumen: El color de la piel en anfibios se determina por la mezcla de tres tipos de pigmentos. La falta de cualquiera de ellos altera la apariencia externa del animal, pudiendo tener consecuencias en su supervivencia. En esta nota se describe el segundo caso de hipopigmentación en tritón jaspeado (*Triturus marmoratus*) en Burgos. La falta de pigmentos negros y azules da lugar a un color naranja muy diferente al clásico patrón negro y verde.

Coloration plays a key role in several aspects of amphibian life history: cryptic or aposematic colors enhance protection against visual predators, while at the same time, it can provide useful information to conspecifics about their fitness or availability for reproduction (Vitt & Caldwell, 2009). Natural selection thus often eliminates aberrantly colored animals (Andrén & Nilson, 1981), which tend to be scarce in nature. Regarding the different color abnormalities, albino or leucistic animals have significantly received more attention than dark pigment variants, as the former are more conspicuous and there is a confusing multiplicity of dark variants involving different pigment cells – the chromatophores (Richards & Nace, 1983).

Amphibians possess three types of pigment cells which determine their coloration in the dermal layer of the skin, i.e. melanophores, iridophores and xanthophores. The primary pigment in melanophores is eumelanin, which imparts black, brown, or red color (Vitt & Caldwell, 2009). Pigments in iridophores are purines such as guanines, stacked in organelles which

Figure 1: Aberrant marbled newt *Triturus marmoratus* (right) compared to a male wild-type-colored conspecific (left) from the same population.
Figura 1: Tritón jaspeado *Triturus marmoratus* con coloración anómala (derecha) comparado con otro individuo de librea típica procedente de la misma población.

Figure 2: Eye detail of the hypopigmented animal.
Figura 2: Detalle del ojo del individuo con hipopigmentación.

reflect golden or silver sparkles or impart blue or green hues when the light is transmitted (Rivera *et al.*, 2001; Vitt & Caldwell, 2009). On the other hand, xanthophores provide yellow, orange, or red coloration due to pteridine and carotenoid pigments (Vitt & Caldwell, 2009). These three chromatophores are arranged as a unit and produce the animal's external coloration, e.g. green as the sum of blue iridophores and yellow xanthophores (Arribas *et al.*, 1995; Vitt & Caldwell, 2009).

Here we report a new case of orangish color aberration in a wild adult of marbled newt, *Triturus marmoratus* Latreille, 1800 (male, 125 mm, Figure 1). It was found in Cernégula (Burgos, Spain, 982 masl, 42º38'23"N / 3º37'35"W), in the flooded surroundings of an artificial irrigation pond amidst agricultural fields with reddish soil. Within the area, more than 10 conspecific individuals were found in the same body of water and all of them exhibited the bright green wild-type coloration.

Color anomalies have been reported several times in *T. marmoratus* in the Iberian Peninsula, including albinism, partial albinism and melanism (see Rivera *et al.*, 2001). Besides, another type of color aberration similar to this case has been reported at least in four different localities of Catalonia: Terres de l'Ebre (Rivera *et al.*, 2001; Rivera *et al.*, 2002), Osona (Moreno *et al.*, 2009), Vallès Oriental (Manzano-Rubio & Fernández-Guiberteau, 2013), Vallès Occidental (Burriel-Carranza, pers. obs.) and Moianès (Rivera *et al.*, 2016) but only one in the rest of the Iberian Peninsula, although originally described as an albino animal (Diego-Rasilla *et al.*, 2007).

Those reports have been explained by hypopigmentation – a partial absence of one or more pigments. First, the contrasting pattern seems to vanish due to a deficiency of melanin, known as hypomelanism. Besides, the striking orange hue comes from the lack of blue pigments. Therefore, xanthophores keep producing yellow and orange pigments but those cannot be added to the blue ones from the iridophores to achieve the usual green appearance (Rivera *et al.*, 2002). However, neither iridophores are completely absent. Such abnormality, called aniridism, produces animals with black irises (Filella-i-Subirà, 2018), whereas our subject had the typical golden-colored eyes (Figure 2).

Flyaks & Borkin (2004) described four different main causes behind an increased number of aberrations in the wild, including coloration-related ones: 1) an effect of hybridization between species, 2) due to injuries or infections, 3) environmental pollutants or 4) the so-called range edge effect. The latter is explained by the breakdown of development

Figure 3: Distribution in the Iberian Peninsula of *Triturus marmoratus* and the localities where similar pigmentary abnormalities have been reported (red dot, new record).
Figura 3: Distribución en la península ibérica de *Triturus marmoratus* y las localidades en las que se han reportado anomalías pigmentarias similares (punto rojo, nuevo registro).

homeostasis, which increases at the boundary of a species range because of population maladaptation at the periphery (Worthington, 1974; Flyaks & Borkin, 2004). Interestingly, the Catalan localities where these aberrant newts had been previously reported are placed near the species' distribution limit in Catalonia or in a disjointed population (Terres de l'Ebre, Tarragona), which might explain the relative abundance of "sporadic" cases within that area.

However, our report seems to be the second in the species in the Iberian Peninsula aside from Catalonia and further from any range edge of the species (Figure 3). As stated before and commonly presumed, color mutations are usually survival hampering, but there are great instances on the contrary as well, such as the industrial melanism (van't Hof *et al.*, 2011). In the same way, the aberrant color of these newts might enhance their crypsis on the reddish soil of that area.

Acknowledgements: We would like to thank X. Rivera and S. Carranza for their kind comments on this report, and A. Ibarzabal, V. Ortega, E. Ikaza and J. Santacristina, for taking part in the finding as well.

References

Andrén, C. & Nilson, G. 1981. Reproductive success and risk of predation in normal and melanistic color morphs of the adder, *Vipera berus. Biological Journal of the Linnean Society*, 15: 235–246.

Arribas, O., Rivera, J. & Martí, F. 1995. Nuevos datos sobre la presencia de individuos azules de *Hyla meridionalis* en el Noroeste Ibérico. *Boletín de la Asociación Herpetológica Española*, 7: 25–28.

Diego-Rasilla, F.J., Luengo, R.M. & Rodríguez-García, L. 2007. *Triturus marmoratus* (Marbled Newt). Albinism. *Herpetological Review*, 38(1): 68.

Filella-i-Subirà, E. 2018. Uns casos d'aniridisme en granotes verdes (*Pelophylax Fitzinger*, 1843) de l'Alt Empordà, Catalunya. *Butlletí de la Societat Catalana d'Herpetologia*, 26: 23–27.

Flyaks, N. & Borkin, L. 2004. Morphological abnormalities and heavy metal concentrations in anurans of contaminated areas, eastern Ukraine. *Applied Herpetology*, 1(3): 229–264.

Krecsák, L. 2008. Albinism and leucism among European Viperinae: a review. *Russian Journal of Herpetology*, 15: 97–102.

Manzano-Rubio, R. & Fernández-Guiberteau, D. 2013. Coloració anòmala en tritó verd *Triturus marmoratus* (Latreille, 1800) a Sant Feliu de Codines (Vallès Oriental) el día 1 de gener de 2013. *Herpetofull de la Societat Catalana d`Herpetologia*, 9: 19–21.

Moreno, D., Fernández, D. & Aranda, D. 2009. Descripció de coloració anòmala en el tritó verd *Triturus marmoratus* (Latreille, 1800) a Taradell (Osona, Catalunya). *Butlletí de la Societat Catalana d'Herpetologia*, 18: 121–122.

Richards, C.M. & Nace, G.W. 1983. Dark pigment variants in Anurans: classification, new descriptions, color changes and inheritance. *Copeia*, 4: 979–990.

Rivera, X., Arribas, O. & Martí, F. 2001. Revisión de anomalías pigmentarias en los anfibios de la península ibérica y de Europa. *Butlletí de la Societat Catalana d'Herpetologia*, 15: 59–74.

Rivera, X., Arribas, O. & Martí, F. 2002. Chromatic alterations in european amphibians and reptiles. *Reptilia*, 33: 33–38.

Rivera, X., Fernández-Guiberteau, D. & Hawlitschek, O. 2016. Nou cas de *Triturus marmoratus* amb coloració anòmala i una nova localització de *Pelophylax* kl. *grafi* al Moianès. *Herpetofull de la Societat Catalana d'Herpetologia*, 12: 26–31.

Van't Hof, A.E., Edmonds, N., Dalíková, M., Marec, F. & Saccheri, I.J. 2011. Industrial melanism in British peppered moths has a singular ad recent mutational origin. *Science*, 332(6032): 958–960.

Vitt, L.J. & Caldwell, J.P. 2009. *Herpetology: An introductory biology of amphibians and reptiles*. Academic Press. Burlington. Massachusetts. USA.

Worthington, R.D. 1974. High incidence of anomalies in a natural population of spotted salamanders, *Ambystoma maculatum. Herpetologica*, 30: 216–220.