

Leucistic neoteny in *Pleurodeles waltl*. First observation recorded in Spain

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RESUMEN: La presente nota da a conocer el primer caso documentado en la península ibérica de un ejemplar neoténico leucístico de *Pleurodeles waltl*. La descripción del ejemplar se acompaña de una breve revisión de las anomalías pigmentarias en esta especie y del concepto de las mismas.

In general, the coloration of animal species plays an important role in avoiding predators, obtaining food, sexual selection, inter- and intraspecies communication and, in the case of ectotherms, also in thermoregulation (Alaminos & López, 2011; Hinckley *et al.*, 2015). Meanwhile, variations or anomalies in the pattern and the color of the species have been widely studied and the timely appearance of colorations and atypical patterns of some of them have been documented (García-Roa *et al.*, 2015). Sometimes the misuse of certain scientific terms is implanted in society, leading to their use with no rigor. This is the case of albinism, which has been stripped off its meaning and its use, has been generalized every time a living being presents a white coloration.

According to García-Morales *et al.* (2010), we should differentiate between albinism, dilution, squizocroism and leucism. Albinism is a rare genetically determined abnormality in wild animals, defined as the absence of melanin produced by a defect in its synthesis by the melanophores in the skin and hair (Diego-Rasilla & Luengo, 2007; Romero & Real, 2007; García-Morales *et al.*, 2010; Alaminos & López, 2011; Jiménez-Cazalla, 2011; Modesti *et al.*, 2011;

Ayllón, 2013). In this case, the iris of the eye does not contain pigment, showing a red coloration due to the blood capillaries (Romero & Real, 2007; Galán, 2010; Jiménez-Cazalla, 2011; Modesti *et al.*, 2011; Ayllón, 2013). Dilution occurs when the color tone is reduced (García-Morales *et al.*, 2010). The squizocroism happens when a pigment is not expressed without affecting another (García-Morales *et al.*, 2010). Finally, leucism is a deficiency of a particular pigment (melanin) or all pigments and differs from albinism that generally possess white or clear yellow skin, hair and scales, but with darkly pigmented eyes and nails (García-Morales *et al.*, 2010; Modesti *et al.*, 2011). In this sense, the leucistic animals do not appear to be more vulnerable to exposure to sunlight and have no vision problems as in albinos (Alaminos & López, 2011; Modesti *et al.*, 2011).

Given these definitions, this paper provides the first record of an individual neotenic leucistic of Iberian ribbed newt (*Pleurodeles waltl*, Michahelles 1830) in the Iberian Peninsula. The specimen was found in the Comes pond (10x10: 31N CF02), 283 masl, Ø = 17.5 m and 1.30 m average depth (Figure 1), in the municipality of El Perelló, Baix Ebre (Tarrago-

Photo Alex Torres-Riera



Figure 1: Comes pond in the village of El Perelló in the province of Tarragona, where the leucistic specimen, *P. waltl*, was found.

Figura 1: Charca de Comes en el municipio de El Perelló en la provincia de Tarragona, donde se descubrió el ejemplar leucístico de *P. waltl*.

na). The discovery was made on 11th February 2016, during the work of management and conservation of that species made by technicians of the Generalitat de Catalunya.

The individual had light-coloured yellow pigmentation in the cutaneous tissue which made it very visible in relation to their congeners (Figure 2, 3 and 4). The yellowing is because these individuals have normal xanthophores and iridophores (Galán, 2010; Jiménez-Cazalla, 2011; Modesti *et al.*, 2011). You can see the external gills with red colouration due to the visualization of blood capillaries (Figure 2 and 3). The iris was golden and the pupil was brown (Figure 4), showing some pigmentation in the retina. This individual lacked design dorsal black spots, except tail, which showed some of them, mainly in the caudal region (Figure 2). The usual coloration of the upper parts of the Iberian ribbed newt have irregular dark spots on olive, brown or gray background and allows them to camouflage in both terrestrial and aquatic habitats (Rivera *et al.*, 2011; Salvador & Martínez-Solano, 2014). In this regard, coloration and absence of spots make these animals more vulnerable to their

predators and more visible by their prey. The specimens that have the mentioned phenotypic abnormalities are easily detectable by their predators and their survival rate is usually rare (Martínez-Silvestre *et al.*, 2009; Galán, 2010; Busack & Donaire, 2014). However, being a crepuscular / nocturnal species and being in a pond with muddy water could have helped their survival.

In this capture session, a total of 88 individuals, 31 adults (10 females, 21 males) were collected and 57 neotenus, this being the only specimen showing an abnormal coloration. In turn, it had captured several individuals of *Pelophylax perezi* (approximately 20 adult individuals) and two larvae of *Pelobates cultripipes* in the same pond.

Within the Amphibia class, although rare, there are several citations of cases of albinism or leucism both in Urodela and in Anura (see for example collections of Rivera *et al.*, 2001; Romero & Real, 2007; Galán, 2010; Jiménez-Cazalla, 2011; or Modesti *et al.*, 2011). In these reviews pigmentary defects in any stage of development, even albin eggs (Ayllón, 2013), are reported.

However, in these records there are not any explicit descriptions of any neotenic individual with abnormalities in coloration. Consequently, this would be the first note reported on a neotenic leucistic amphibian as long as we know. In the case of the Iberian ribbed newt, these anomalies are reported infrequently, suggesting that individuals who survive are rare or that the condition itself is rare (Busack & Donaire, 2014). There are three registers of full albinism in larvae of *P. waltl*, four partial albino adults and leucistic larva and other not well defined cases in their pigmentary anomalies (see collection Busack & Donaire, 2014, or Salvador & Martínez-Solano, 2014).

Moreover, this individual can be neoteny - paedomorphosis in which sexual maturity is



Figure 2: Individuals of *P. waltl*, neotenic with normal colour (left) and leucistic neotenic (right).

Figura 2: Ejemplares de *P. waltl*, neoténico con coloración normal (izquierda) y neoténico leucístico (derecha).

reached maintaining larval characters (Fuentes *et al.*, 2011), as it presents a big size and developed limbs of adult character and preserves the reduced external gills and a soft epidermis as characters of larval stage (Figure 3). However, we can not have absolute security that the individual is neotenic as we would have to check their sexual maturity watching its genitalia, surely killing him. In certain cases, neoteny can be considered as an evolutionary advantage determined by recessive genes and influenced by environmental conditions (Fuentes *et al.*, 2011). It would be advisable to study these populations, as they represent the northernmost limit of the northeastern end of the distribution of the species (Fontanet *et al.*, 1982; Llorente *et al.*, 1995; Orriols, 2009; Rivera *et al.*, 2011; Salvador & Martínez-Solano, 2014), and these are in sharp decline (Guinart-Patiño *et al.*, 2012).

Given that morphological variability and coloration of the populations of this species have not been studied in detail (Salvador & Martínez-Solano, 2014) and that the frequency of observation of these abnormalities is increasing, it would be justified an additional investigation recording future anomalies in more precise notes to allow a more detailed study (Busack & Donaire, 2014).



Figure 3: Side view of a leucistic individual, where the spots are seen in the caudal region. Note the pigmentation of external gills and the development of their limbs.

Figura 3: Vista lateral del individuo leucístico, donde se aprecian las manchas en la región caudal. Obsérvese la pigmentación de las branquias externas y el desarrollo de sus extremidades.



Figure 4: *Pleurodeles waltl* larva. Front detail of a normal neotenic morphotype (left) and of a leucistic neotenic individual (right). Both individuals showed the normal pigmentation of the pupil and the iris.

Figura 4: Larva de *Pleurodeles waltl*. Detalle frontal de un neoténico de morfotipo normal (izquierda) y del neoténico leucístico (derecha). Se puede observar la pigmentación normal de la pupila e iris en ambos individuos.

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