

## Red tail in male spiny footed lizards *Acanthodactylus erythrurus* during the breeding season

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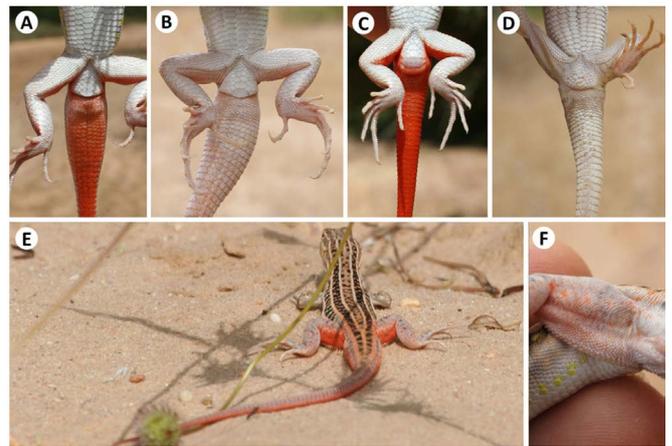
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The spiny footed lizard *Acanthodactylus erythrurus* (Schinz, 1833) is a widely distributed lacertid from the Iberian Peninsula and north-west Africa (Sindaco & Jeremcenko, 2008) of which the complex taxonomy continues to be an ongoing topic of discussion (Harris et al., 2004; Fonseca et al., 2009; Miralles et al., 2020). This species complex displays visible polymorphism throughout its range, although its features of sexual dimorphism are considered to be invariable across all phenotypic forms (Schleich et al., 1996; Salvador, 2014). Chromatic dimorphism mainly consists of the accentuation of colouration in males, especially the lateral yellow ocelli, whilst in females the tail and hind legs exhibit a conspicuous red/orange colouration. These characteristics are evident both in the population of north-west Africa (Schleich et al., 1996), as well as in the populations of the Iberian Peninsula (González de la Vega, 1989; Ortiz-Santaliestra et al., 2011; Fresnillo et al., 2015). It has even been suggested that there are no examples of males displaying tails with red colouration (Barbadillo, 1994). Hypotheses that aim to account for this sexual dimorphism contemplate the possibility that the red tail observed in sexually receptive females could be linked to mating, whilst the loss of colouration could be linked to pregnancy (Cuervo & Belliure, 2013).

This report describes various observations of male individuals with intense red colouration of the tail and hind legs during the breeding season in the Campo de Gibraltar region of the Province of Cadiz in the south-east of the Iberian Peninsula.

The first observation took place in May 2004 in Pinar del Rey (36°15' N, 5°25' W; UTM 30S TF 83 14), through the capture of an adult individual with a snout-vent length over 6 cm and unmistakably male characteristics (large and prominent femoral pores and broad tail-base) displaying red colouration of the tail and hind legs. As juveniles display red tails, it was originally thought possible that the individual had retained certain immature characteristics and therefore that this was an anecdotal observation of a persistent juvenile trait.

Subsequent sporadic observations without capture were made in the same location during the period 2010-2012, leading to sampling in 2013 during the months of May and June. On the 31st May, four males and five females were observed, with all nine individuals displaying red colouration of equal intensity and extension (Fig. 1. A, C, E). On 17th June, only two males and two females were observed, due to unfavourable weather conditions during sampling. None



**Figure 1.** Tail colouration in male *Acanthodactylus erythrurus*- **A.** 31 May, **B.** 17 June; Tail colouration of female *A. erythrurus* - **C.** 31 May, **D.** 17 June; Close-up of hind legs of male, **E.** 31 May, **F.** 17 June



**Figure 2.** Gravid female *Acanthodactylus erythrurus*, 17 June

of the four individuals displayed conspicuous red colouration (Fig. 1. B, D), with only one male still displaying very indistinct orange traces on the hind legs (Fig. 1. F). One of the females was observed to be gravid (Fig. 2). On 21st May 2019, a male was observed with colouration of the tail in El Chapatal (36°16' N, 5°26' W; UTM 30S TF 82 18), approximately 3.5 km from the site of the first observations.

In principle, the combination of observations made indicate that males and females acquire and lose red colouration simultaneously, as it was in the month of May when maximum colour intensity was observed. Large specimens were not observed during the sampling, so the phenomenon has only been observed in males during their first reproductive year. All individuals were found in the grid 30S TF 81 belonging to the metapopulation present in the eastern area of the Campo de Gibraltar, which covers grids 30S TF 90, TF 91 and TF 92. Mitochondrial DNA analyses have shown the existence of two clades in the Iberian Peninsula. E2 is restricted to the provinces of Cadiz and Malaga whilst E1 occupies the rest of the peninsular area (Fonseca et al., 2009). Further research into the populations located in the Province of Malaga would be necessary in order to determine this as an identifying characteristic of the E2 clade.

These observations rule out red tail colouration as a decisive feature of sexual dimorphism in sexually receptive females. This should be confirmed in other populations and a new hypothesis formulated explaining the evolutionary reason for this characteristic in males.

### ACKNOWLEDGMENTS

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