A record of thanatosis behaviour in *Coronella girondica* (Reptilia: Colubridae)

Arancha de Castro-Expósito[1], Francisco Guerrero[1,2] & Enrique García-Muñoz[1,3,4,*]

[1] Departamento de Biología Animal, Biología Vegetal y Ecología. Universidad de Jaén. Campus de las Lagunillas, s/n. 23071 Jaén. Spain. C.e.: engamu@gmail.com
[2] Centro de Estudios Avanzados en Ciencias de la Tierra (CEACTierra). Universidad de Jaén. Campus de las Lagunillas, s/n. 23071 Jaén. Spain.
[3] CESAM, Centro de Estúdios de Ambiente o do Mar. Universidade de Aveiro, Campus Universitário de Santiago. 3810-193 Aveiro. Portugal.
[4] CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos. Universidade do Porto, Campus Agrário de Vairão. 4485-661 Vairão. Portugal.

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Resumen: La tanatosis o fingimiento de la muerte es un comportamiento de defensa que ha sido previamente descrito en muchas especies. Este es el primer registro de comportamiento de tanatosis en la especie de ofidio *Coronella girondica*. Dicha observación ha sido realizada en el Parque Natural de las Sierras de Cazorla, Segura y Las Villas, en el sur de España.

Thanatosis or tonic immobility is a defence behaviour that appears in some reptile and amphibian species (Gehlbach, 1970; Toledo *et al.*, 2011). This behaviour is characterized by the fact that the individual becomes totally flaccid, sometimes the tongue is left outside with the mouth half open, the pupils are turned towards the edge of the eye, and the body becomes partially or totally reversed (Kreiner, 2007). It is considered as a secondary defence mechanism and it requires the previous predator's stimulus to appear, thus reducing the success of the attack.

Thanatosis has been reported in some Iberian species of reptiles such as the common wall lizard (*Podarcis muralis*) or the western Iberian sand lizard (*Psammodromus occidentalis*) (Fernández-Guiberteau & Carrero, 2016); as well as in snakes, such as the viperine snake (*Natrix maura*), the Montpellier snake (*Malpolon monspessulanus*), the Aesculapian snake (*Zamenis longissimus*) or the smooth snake (*Coronella austriaca*) (Jelic & Vilaj, 2011; Iftime & Iftime, 2014; Sannolo *et al.*, 2014; Fernández-Guiberteau & Carrero, 2016).

This paper presents the first record of thanatosis to our knowledge for the southern smooth snake (*Coronella girondica*); this being the first graphic evidence for this species (Figure 1). The specimen of *C. girondica* with tonic immobility behaviour was located on May 27 2016 in Siles (Jaén province- south of Spain), in the Natural Park of Sierras de Cazorla, Segura and Las Villas, near a pond (30S x: 543169; y: 4249467; 1280 masl).

Figure 1: Behaviour of feigning death recorded in *C. girondica*. Photograph show the supination of the body.
Figura 1: Comportamiento de muerte fingida registrado en *C. girondica*. La fotografía muestra la supinación del cuerpo.

Table 1: Comparison of the response found in *C. girondica* with other European snake species (data extracted from Gregory *et al.*, 2007; Gregory, 2008; Jelic & Vilaj, 2011; Iftime & Iftime, 2014). *Malpolon monspessulanus* is not included in this table because Sanolo *et al.* (2014) only mention that this snake remained flaccid and in an apparent death condition.
Tabla 1: Comparación de la respuesta encontrada en *C. girondica* con otras especies de ofidios europeas (datos extraídos de Gregory et al., 2007; Gregory, 2008; Jelic & Vilaj, 2011; Iftime & Iftime, 2014). No se incluye a *Malpolon monspessulanus* en esta tabla porque Sanolo *et al.* (2014) sólo mencionan que esta serpiente permaneció flácida y en una condición de muerte aparente.

Conducts/Species	*Coronella girondica*	*Coronella austriaca*	*Natrix natrix*	*Natrix tessellata*	*Natrix maura*	*Zamenis longissimus*
Supination	X	X	X	X	X	X
Mouth gaping	--	--	X	Sometimes	--	--
Tongue hanging free	--	--	X	Sometimes	--	--
Defecation	--	--	X	X	--	--
Pupil moved to the edge	X	X	X	X	X	--
Malodorous cloacal fluid	--	--	--	--	X	X
Location	Sierra Cazorla (Spain)	Poštak mountains (Croatia)	Poštak mountains (Croatia)	Poštak mountains (Croatia)	Osona (Spain)	South Bohemia (Czech Republic)

The study individual was found under a rock, and when the rock was turned the individual started this behaviour. In order to get the correct identification of the individual (possible confusion with *C. austriaca*), the snake was hand captured. The snake showed no apparent wounds and after a few seconds of manipulation, the individual started the tonic immobility. The thanatosis behaviour of this individual of *C. girondica* was characterized by the presence of supination and pupil moved to the edge, the two most common traits registered in snakes in which thanatosis has appeared (Table 1). After the correct species recognition, the snake was released in the same rock where it was found and after few seconds (was not measured but around 30 seconds), the individual started its normal behaviour and hid again in the same refuge where it was found.

Thanatosis behaviour has been characterized in the bibliography by the presence of six different conducts (Table 1). Iberian species in which this behaviour has been recorded showed from two to five of these conducts. In this sense, both species of the genus *Coronella* showed the same conducts, with supination and pupils moved to the edge (Jelic & Vilaj, 2011; this study). *Zamenis longissimus* also showed two conducts, with supination and release of malodorous cloacal fluid (Iftime & Iftime, 2014). However, the more complex behaviour is registered in the species of the genus *Natrix*, which, besides the above mentioned conducts, also showed mouth gaping, tongue hanging free and defecation (Gregory *et al.*, 2007; Gregory, 2008; Jelic & Vilaj, 2011; see Table 1).

It would be interesting to gather more data about this behaviour in order to increment the knowledge of the intrinsic and extrinsic factors

that influence the expression of defensive behaviour (Durso & Mullin, 2013) and to be able to extract the phylogenetic inertia that could be present in the evolution of the feigned death behaviour.

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