

Two cases of melanism in the Ring-headed Dwarf Snake *Eirenis modestus* (Martin, 1838) from Kastellorizo, Greece (Serpentes: Colubridae)

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Pigmentation serves a protective role in many animals, including snakes, whether it functions in camouflage, warning, mimicry, or thermoregulation (Bechtel, 1978; Krecsák, 2008). The observable colouration and pattern of a snake is the result of the presence of variously coloured pigments in specific places in the skin (Bechtel, 1978). Four different types of pigment-bearing cells called chromatophores can be found in the skin of reptiles, namely melanophores, iridophores, erythrophores, and xanthophores (Bechtel, 1978). Abnormalities in the pigment formation or the interaction between the different types of pigment may result in various chromatic disorders, which cause abnormal colouration of the skin and its derivatives (Rook et al., 1998). There are many literature reports describing chromatic anomalies in snakes, of which the most frequently observed in the wild are melanism, leucism, and albinism (Krecsák, 2008; Castella et al., 2013; Bruni, 2017; Jablonski et al., 2017).

Melanism is a well-studied condition in some taxa, and the possible genetic basis of this variation has received considerable attention in the literature (Theron et al., 2001; Hoekstra and Nachman, 2003; McRobie et al., 2009; Alho et al., 2010). Melanistic individuals exhibit an increased amount of dark pigmentation. This condition is rather common in snakes and is recorded in many European reptile species by the presence of almost totally black individuals in normally otherwise-coloured populations, and there even exist entire populations with that phenotype (e.g., Zuffi, 2008; Domeneghetti et al.,

2016). A possible adaptive hypothesis for melanism in snakes is protection against sun damage (Lorioux et al., 2008; Jablonski and Kautman, 2017).

The Ring-headed Dwarf Snake, *Eirenis modestus* (Martin, 1838), is a medium-sized colubrid snake reaching a maximum total length of 70 cm (Çiçek and Mermer, 2007). The Dwarf Snake inhabits rocky areas with sparse vegetation and often hides under stones, where it feeds mainly on terrestrial arthropods (Çiçek and Mermer, 2007). It is widely distributed (Fig. 1), occurring mainly in the Caucasus (Armenia, southern Azerbaijan, eastern Georgia, southern Russia), Greece (on the islands of Alatonissi, Chios, Fournoi, Kalymnos, Kastellorizo, Leros, Lesvos, Samiopoula, Samos, and Symi), northwestern Iran, and Turkey (Çiçek and Mermer, 2007; Mahlow et al., 2013). Its presence in

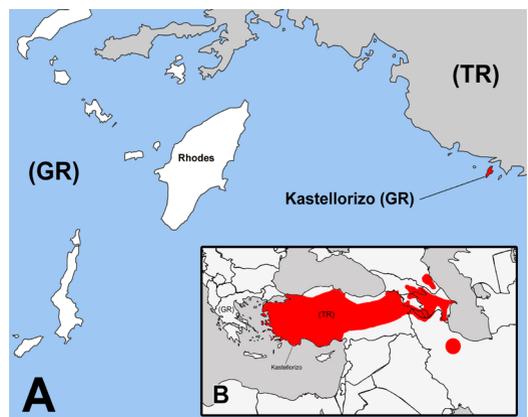


Figure 1. (A) Map showing the location of Kastellorizo Island, Greece. (B) Map showing the approximate geographic distribution of *E. modestus*, according to Mahlow et al. (2013).

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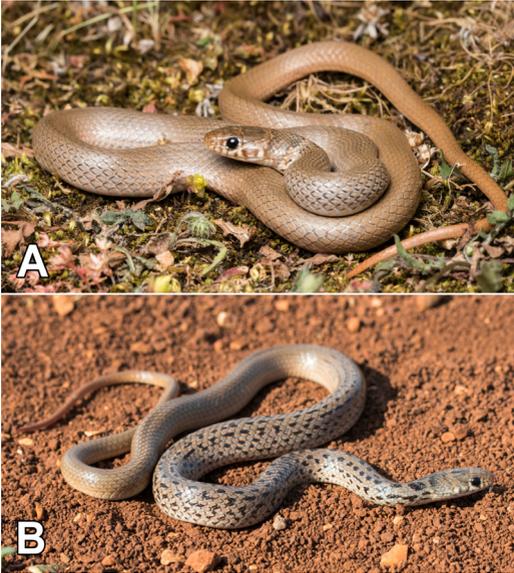


Figure 2. Normally coloured individuals of the Ring-headed Dwarf Snake (*Eirenis modestus*). (A) A specimen with typical uniform colouration of light brown to greyish found on 20 April 2017 on Symi Island, Greece. (B) A specimen with rows of dark blotches in the first half of the body from Kastellorizo found on 3 May 2017. Photos by Konstantinos Kalaentzis.

Turkish Thrace and Iraq requires confirmation (Mahlow *et al.*, 2013). The species exhibits a typical uniform colouration of light brown to greyish (Fig. 2A), while individuals with rows of dark blotches in the first half of the body (Fig. 2B) exist in many populations, including in southern Anatolia, Turkey (Baran, 1986; Kumlutas *et al.*, 2004) and on the Greek island of Symi (Wilson and Grillitsch, 2009). Melanistic specimens of *E. modestus* have already been reported from the province of Muğla and the islands of Yassica and Sarios in Turkey (Baran, 1986; Mahlow *et al.*, 2013). Herein we present two cases of *E. modestus* melanism on the island of Kastellorizo, one of the Dodecanese Islands of Greece.

Materials and Methods

The authors visited the island of Kastellorizo on 1–5 May 2017 within the framework of a herpetofaunal survey. Individuals of *E. modestus* were found by active searching at different hours of the day in a variety of habitats. All of the observed individuals were caught, examined, and photographed using a Canon EOS 7D Mark II digital SLR camera equipped with

a 60 mm macro lens. For the melanistic individual, measurements of total and tail length were made to the nearest cm using a flexible measuring tape, and pholidosis characteristics were taken. Photographic data of an additional observation were provided by P. Katsiyiannis, who visited the island for three days in April 2015. Photographic vouchers for both cases were deposited in the collection of amphibians and reptiles at the Natural History Museum of Crete (NHMC).

Results

In the course of the five-day expedition we spotted nine individuals of *E. modestus*, including one melanistic individual (Fig. 3A,B; NHMC 80.3.43.7). This individual was found on 2 May 2017 at 1415 h, coiled up under a stone, on a slope at an elevation of 25 m in the eastern part of the town of Megisti (36.147°N, 29.596°E).

Overall colouration of the body was dark grey, with rows of blotches significantly darker. The upper side of the head and the U-shaped collar were notably darker than the rest of the body and the tail became increasingly black towards its end. The whole underside of the body and parts of the upper labial scales varied between greyish and white. Small grey nuanced areas occurred in the dorsal side of the head, more specifically in both of the parietals, the frontal, the left prefrontal and the right supraocular scales. The eyes were dark and the pupils were not visible.

The individual had a total length of 480 mm, with a tail length of 110 mm. With respect to pholidosis, the individual presented 17 dorsal midbody scale rows and 165 ventral scales, seven supralabials, eight infralabials, one loreal, one preocular, and two postoculars. These results agree with the known morphological characters of the species (Mahlow *et al.*, 2013). However, an anomaly was observed in the supralabials on the right side, where the fifth and sixth scales were fused into a single scale. The individual was released at the site of capture.

In addition, on 18 April 2015 a juvenile melanistic individual was captured and photographed (Fig. 3C; NHMC 80.3.43.8) on the island's plateau (36.138°N, 29.589°E, elevation 175 m). No morphometric data were collected and the specimen was released shortly after photographs were taken.

Discussion

The two aforementioned observations were made during short expeditions and this could suggest that



Figure 3. Melanistic individuals of the Ring-headed Dwarf Snake (*Eirenis modestus*) from Kastellorizo Island, Greece. (A) An adult specimen found on 2 May 2017. Small grey nuanced areas in the dorsal side of the head are denoted. (B) Close-up of the head of the same specimen as in (A). The fifth and the sixth supralabial scales of the right side are fused into a single scale. (C) A juvenile specimen found on 18 April 2015. Photos by Konstantinos Kalaentzis (A, B) and by Philippos Katsiyiannis (C).

the described morphotype is frequent among the island's population of *E. modestus*. However there is no reference of a melanistic Ring-headed Dwarf Snake on Kastellorizo, even though there have been previous herpetofaunal surveys on the island (Valakos and Papapanagiotou, 1985; Paysant, 2005). More field research is necessary to assess how common this morphotype is on Kastellorizo, and further genetic and ecological studies would be needed to see if there is an evolutionary significance to melanism on this island.

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