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First record of leucism in the Karpathos Salamander, *Lyciasalamandra helverseni* (Pieper, 1963)

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Leucism in animals is a pigmentary aberration characterised by a total or partial lack of melanin in the skin, hair, or feathers, while eyes typically retain normal colouration. Although the exact definition of leucism seems to vary in the literature, the absence of depigmentation in the retina is regarded as a defining characteristic (Gould, 2025). Leucism has been documented for multiple vertebrate classes, including amphibians, reptiles, birds, and mammals. Within amphibians, cases occur across all major orders, salamanders included (Almeida-Reinoso et al., 2023). European records span several species, among them the Fire Salamander *Salamandra salamandra* (Lunghi et al., 2017; Vlad et al., 2020), three species of *Hydromantes* salamanders (see Lunghi et al., 2017), the Italian Crested Newt *Triturus carnifex* (Lunghi et al., 2017), the Smooth Newt *Lissotriton vulgaris* (Hulse and Bonthron, 2024), the Italian Newt *Lissotriton italicus* (Capula et al., 2023), and the Alpine Newt *Mesotriton alpestris* (taxonomy following Mutz and Böhme, 2025), documented by Heiss (2017). These cases are presented as representative rather than exhaustive. In all reviewed cases leucism seems to be rare and only found in a small number of individuals. Furthermore, pigmentation anomalies remain poorly documented in several geographically restricted salamander lineages of the eastern Mediterranean. The genus *Lyciasalamandra* represents one such group for which records of pigmentary aberrations are scarce.

The Karpathos Salamander, *Lyciasalamandra helverseni* (Pieper, 1963), is an endemic, terrestrial salamander from the Dodecanese (Greece), where it occurs in moist, shaded habitats on the islands of Karpathos, Kasos and Saria (Sparreboom, 2014). The species is known for its pronounced sexual dimorphism and nocturnal activity, with individuals most frequently observed above ground during periods of rainfall (Polymeni, 1999). Like other *Lyciasalamandra* species, it has a restricted distribution and is active only during a limited part of the year around the winter months (Sparreboom, 2014). The species is assessed as Vulnerable given its limited distribution, vulnerability to the effects of climate change, and the risk of *Batrachochytrium salamandrivorans* introductions (Sotiropoulos et al., 2023). This vulnerability may be exacerbated as studies indicate that this species has limited dispersal abilities (Polymeni, 1994 as cited in Eleftherakos et al., 2007) and its habitat is fragmented (Li et al., 2020).

On 15 January 2026, at approximately 09:00 h, an abnormally pigmented *Lyciasalamandra helverseni* female was found on the island of Karpathos, Dodecanese, Greece (Fig. 1). The species was identified by the general morphology: a slender body, gracile limbs, protruding eyes, and prominent parotoid glands. Identification was supported by its occurrence on Karpathos, where *L. helverseni* is the only salamander species. The animal was sexed as a female based on secondary sexual features of the species: the absence of the hedonic gland and the narrow base of the tail (Pieper, 1963). The observed specimen exhibited a strongly depigmented pink-yellow phenotype (Fig. 2). The eyes appeared normally pigmented, indicating a leucistic individual. Despite the leucistic condition, the parotoid glands, eyelids, parts of the legs, and the lateral and dorsal surfaces retained yellow colouration to varying degrees. Light iridescent patterns could also be observed on the skin. This indicates pigmentation independent of melanin production. It is consistent with the presence of other chromatophores in amphibian skin, such as xanthophorederived yellow pigments and iridophorederived lightscattering or reflecting pigments (Rudh and Ovarnström, 2013; Gould, 2025).

The individual was found beneath a flat limestone rock at the foot of a shaded, west-facing, forested limestone slope. The base of the slope forms a moist microhabitat

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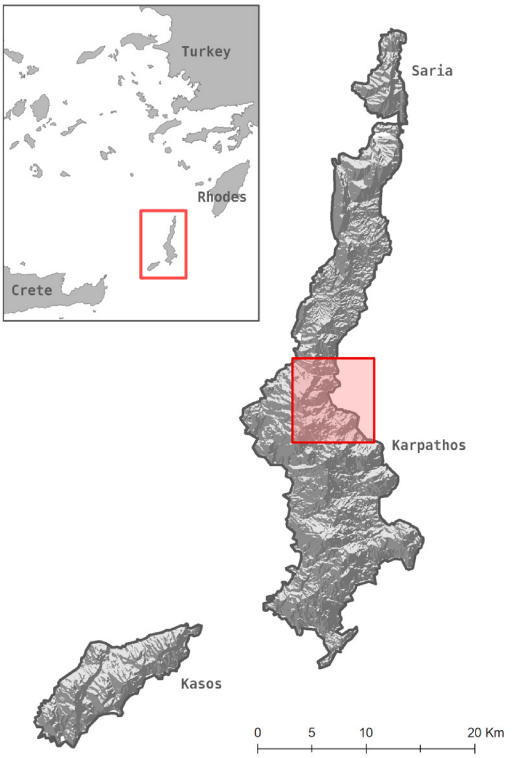

Figure 1. Approximate location of the observation on Karpathos, shown within a 7.5 km grid cell. The inset map indicates the position of Karpathos in the southeastern Aegean Sea.

with damp soil. The locality lies approximately 500 meters from the coastline and consists of a humid, open, valley-like depression in the landscape, surrounded by limestone slopes (Fig. 3). This corresponds well with typical *Lyciasalamandra* habitat (Sparreboom, 2014). The weather conditions were calm, sunny and nine degrees Celsius. Several other normally pigmented ("wild-type") individuals were observed at the same location (Fig. 2F). The abnormally pigmented female was documented with photographs and released in the same location. No samples or measurements were taken. Exact geographic coordinates were recorded but are withheld for conservation reasons. Coordinates are available from the author upon reasonable request.

No records of leucism or hypomelanism in *Lyciasalamandra helverseni* or other *Lyciasalamandra* species were found in the scientific literature. This conclusion is based on a systematic search of Web of Science, Scopus, and Google Scholar. I searched the literature using combinations of the species name (including historical synonyms), other species within the genus, the genus name itself, and standard pigmentation-related terms (e.g., leucism, phenotype, hypomelanism, pigmentation anomaly, colour aberration, colour morph, albinism). To the best of my knowledge, this represents the first documented case of leucism for the Karpathos Salamander and for the genus *Lyciasalamandra*.

The defining characteristics of leucism are regarded to be a partial or total lack of pigmentation, that does not affect the retina. According to Gould (2025), case studies of leucism in amphibians mostly describe instances of hypomelanism, without clarifying whether other chromatophores are absent. Gould (2025) therefore proposes viewing leucism (as well as piebaldism and albinism) as a pattern of melaninbased deficiency. This record of leucism in the Karpathos Salamander could also be viewed in this regard, as melanin seems to be the main deficient pigment. Here, I follow the prevailing descriptive usage of the term leucism, as the phenotype is characterised by a reduction of melanin while eye pigmentation remains unaffected. Nevertheless, clarification of underlying pigmentary mechanisms through histological or genetic approaches would help to refine terminology and improve conceptual consistency in future studies.

The appearance of leucism in wild populations has been generally interpreted as the expression of a recessive allele (Owen and Skimmings, 2008; Reis et al., 2019). Eleftherakos et al. (2007) have observed low levels of polymorphism and a lack of heterozygotes in populations of the Karpathos Salamander and suggest severe population bottlenecking. Such demographic constraints may facilitate the expression of recessive traits. According to Kirk (2024), in small and isolated populations the frequency of such alleles is influenced largely by genetic drift, which may lead to their fixation or loss by chance. The occurrence of a leucistic individual raises the question of whether similar recessive abnormalities are present at a higher frequency than currently documented. However, based on a single observation, no conclusions can be drawn regarding the prevalence or population-level significance of this phenotype. Targeted genetic analyses and broader population sampling are required to assess levels of genetic diversity and to determine whether the observed phenotype reflects an isolated aberration or a recurring recessive trait within this population.

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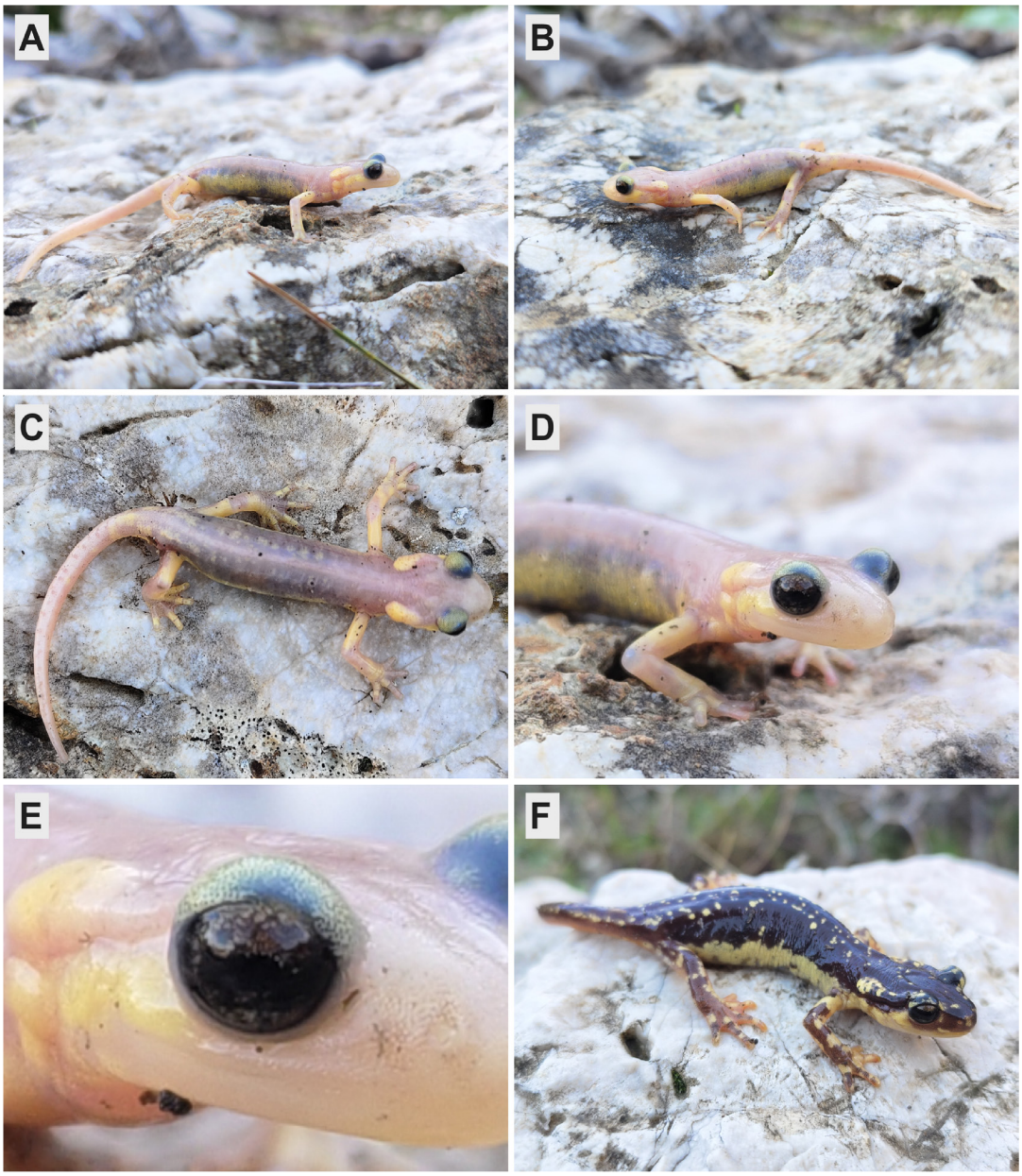

Figure 2. The observed female Karpathos Salamander *Lyciasalamandra helverseni*, showing a strongly depigmented pink-yellow phenotype. Parts of the skin surface have retained yellow and iridescent colouration to varying degrees. (A) Right lateral side with yellow-iridescent pigmentation, mainly on the lower side. (B) Left lateral side with comparable pigmentation. (C) Dorsal side with a slight patterned dorsal pigmentation and stronger pigmentation on the eyelids. (D) Close-up view of the head, showing normal pigmentation in the eyes. (E) Close-up view with more detail of the right eye. (F) A normally coloured "wild-type" female, observed in the same locality. Photos by Ari Gitsis.

Figure 3. Locality of the observation. The foot of a forested limestone slope that contains moist microhabitats with limestone rocks and phrygana vegetation. Photo by Ari Gitsis.

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