

Natural History Sciences

https://sisn.pagepress.org/nhs

eISSN 2385-0922

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Natural History Sciences 2026 [Online ahead of print]

Please cite this article as: *Matteo Riccardo Di Nicola, Andrea Cusmano, Federico Marrone, Francesco Paolo Faraone*
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Natural History Sciences doi: 10.4081/nhs.2026.1045

Submitted: 18 June 2026
Accepted: 2 November 2026

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A new record of hypopigmentation in a metamorph of *Discoglossus pictus* Otth 1837 (Anura: Alytidae) from Sicily (Italy), with a review of the available evidence

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Abstract - A recent record of a hypopigmentary colour anomaly in a newly metamorphosed painted frog, *Discoglossus pictus*, observed in Sicily (Italy), is reported. The individual showed markedly reduced pigmentation, pale yellow to pinkish-brown colouration, reddish eyes, and a faint dorsal pattern. The observation is described and contextualised within the few cases previously reported in the literature for the species.

Key words: albinism, amelanism, Amphibia, hypomelanism, Painted frog.

Riassunto - Una nuova segnalazione di ipopigmentazione in un neometamorfosato di *Discoglossus pictus* Otth 1837 (Anura: Alytidae) in Sicilia (Italia), con una revisione delle evidenze disponibili.
Viene riportata una recente osservazione di un'anomalia ipopigmentaria in un individuo neometamorfosato di discoglosso dipinto, *Discoglossus pictus*, osservato in Sicilia (Italia). L'individuo mostrava una pigmentazione marcatamente ridotta, una colorazione dal giallo pallido al bruno-rosato, occhi rossastri e un debole disegno dorsale. L'osservazione viene descritta e contestualizzata nell'ambito dei pochi casi precedentemente riportati in letteratura per la specie.

Parole chiave: albinismo, amelanismo, Anfibi, discoglosso dipinto, ipomelanismo.

The painted frog, *Discoglossus pictus* Otth 1837, is a western Mediterranean alytid anuran naturally occurring in north-western Africa, the Maltese Archipelago and Sicily, with introduced populations in southern France and Spain; in Sicily, the species is currently considered widespread and occurs in a broad range of aquatic and semi-aquatic habitats, including temporary ponds, slow-flowing streams, drinking troughs, agricultural water tanks and artificial water bodies (Lo Valvo *et al*., 2017; Restivo & Lo Valvo, 2025). In Sicilian populations, adults have a mean snout-vent length of about 55.9 mm in males and 57.8 mm in females, with recorded ranges of 44.9-72.9 mm and 46.2-66.1 mm, respectively (Lo Valvo *et al*., 2017). These populations show marked dorsal colour pattern polymorphism. The most frequent phenotype is the spotted or ocellated form (Fig. 1A, 1B), characterised by a brown, olive-green, sandy or yellowish dorsal ground colour with dark spots of variable extent; a less frequent striped phenotype shows a median dorsal stripe and two yellowish dorsolateral stripes converging towards the head (Fig. 1D); a rarer concolor phenotype has spots absent or only weakly marked (Fig. 1C) (Palcich, 1957; Lanza *et al*., 2009; Lo Valvo *et al*., 2017).
Reports of hypopigmented phenotypes in *D. pictus* are scarce and include records from both larval and post-metamorphic stages (Tab. 1). Herein, we report a new record of hypopigmentation in a metamorph of *D. pictus* from Sicily.
On 27 April 2026, a newly metamorphosed individual of *D. pictus* was observed within the urban perimeter of Gibellina (37°48'37.87"N, 12°52'05.85"E; province of Trapani, Sicily, Italy), inside a small temporary pond where hydrophytic vegetation is dominated by the charophyte *Chara vulgaris*

L. (Fig. 1G). The individual had a snout-urostyle length of approximately 12 mm and showed an overall pale-yellow colouration, with the darker areas appearing faintly pinkish brown (Fig. 1E, 1F). The dorsal pattern was still visible and clearly resembled the striped phenotype: the areas corresponding to the yellowish median and dorsolateral stripes of normally pigmented striped individuals were very pale yellow, whereas the surrounding darker areas were represented by slightly darker, but still markedly faded, yellowish-brown pigmentation. The eyes appeared pale reddish, with a pinkish-red pupil instead of the dark pupil usually observed in normally pigmented individuals. No other external morphological anomalies were apparent; the limbs were normally developed. Hundreds of normally coloured newly metamorphosed *D. pictus* were simultaneously present in the pond, predominantly displaying the dorsal striped pattern. The surrounding area was historically used as a motocross and enduro track; the persistent mechanical impact of off-road vehicles generated soil depressions that, following the abandonment of sport activities, initiated a process of spontaneous renaturalisation. This phenomenon has allowed high-value microhabitats to re-emerge spontaneously within an urban matrix, urging the need for formal environmental protection and ecological valorization of the area.

Colour anomalies involving reduced pigmentation are widely reported in amphibians (e.g., Lunghi *et al*., 2017; Bruni *et al*., 2020; Allain *et al*., 2023; Dubey & Gloor, 2023; Di Nicola *et al*., 2025) and may result from different chromatophore deficiencies (Henle *et al*., 2017; Gould, 2025). In amphibians, skin and eye colouration is produced by the interaction of several pigmentary and structural cell types, mainly melanophores, xanthophores, and iridophores; therefore, externally similar pale phenotypes may arise from different combinations of affected and unaffected chromatophores and may reflect hypo-melanism, hypo-xanthism, hypo-iridism, or combinations of these deficiencies (Henle *et al*., 2017; Gould, 2025). Recent terminology proposed for amphibians recommends classifying such conditions according to the chromatophore type and tissue affected, with amelanism representing the extreme expression of hypo-melanism, namely the complete absence of melanin across all tissues, and "partial" being best reserved for spatially restricted deficiencies rather than for incomplete diagnostic certainty (Gould, 2025). This makes the visual classification of hypopigmented individuals difficult when observations are based only on external appearance; however, detailed photographic descriptions remain especially important when histological confirmation is not available (Gould, 2025).

The *D. pictus* individual was not collected; therefore, no histological or genetic analyses were performed. Based on the markedly reduced pigmentation, the pale yellow to pinkish-brown tones, and the reddish appearance of the eyes, the phenotype is compatible with amelanism, commonly referred to as albinism (Gould, 2025). The persistence of a faint dorsal pattern does not exclude this interpretation, as residual yellowish, orange, or pale brown patterning may remain visible when non-melanic components, such as xanthophore-derived pigments or structural elements, still contribute to the observed colouration (Dubey & Gloor, 2023; Gould, 2025).

The apparent scarcity of records of anomalous hypopigmentation beyond the larval stage in amphibians may partly reflect reduced survival of affected individuals (Browder, 1972; Henle *et al*., 2017; Di Nicola *et al*., 2025). Reduced photoprotection against UV-B radiation, particularly in environments exposed to intense sunlight (Hofer & Mokri, 2000; Franco-Belussi *et al*., 2018), and developmental or metamorphic difficulties (Henle *et al*., 2017; Di Nicola *et al*., 2025; Alansari *et al*., 2026) may contribute to this disadvantage.

Compared with the records summarised in Table 1, our observation represents an additional post-metamorphic occurrence of a markedly hypopigmented *D. pictus* in Sicily, following previous reports of a subadult individual from Marina di Ragusa and a newly metamorphosed albino individual from Palermo. Available evidence remains insufficient to infer the possible causes of the presence and frequency of such phenotypes in Sicilian populations. Potential causes may include genetic factors or environmental influences affecting pigment-cell development, as generally reported for amphibian colour anomalies (Henle *et al*., 2017; Gould, 2025). Additional well-documented observations, especially when accompanied by photographs and information on life stage, locality, and habitat, would help clarify the occurrence of hypopigmented phenotypes in this species.

Acknowledgements
We thank Prof. Angelo Troia and Dr. Dario Salemi for their help with fieldwork and habitat characterisation. We are also grateful to Salvatore Russotto for kindly providing us with a photograph of a wild individual.

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Tab. 1 - Records of hypopigmented phenotypes in *Discoglossus pictus* reported in the literature. / Occorrenze di fenotipi ipopigmentati in *Discoglossus pictus* riportati in letteratura.

Reference	**Locality**	**Description**	**Photo available**
Boulenger, 1897	Captive offspring from Algerian *D. pictus* kept in captivity	One tadpole described as flesh-coloured with large pale golden spots; albinism was considered imperfect because the pupil was black and some brown pigment later appeared on the back.	No
Spadola & Insacco, 2010	Marina di Ragusa, Sicily, Italy	One subadult with incomplete albinism, showing uniform whitish skin and black eyes.	Yes
Escoriza, 2012	Near Montemaggiore Belsito, Palermo, Sicily, Italy	One albino tadpole found among normally pigmented conspecifics; lack of ocular pigment was interpreted as full albinism.	Yes
Lo Valvo *et al*., 2017	Orto Botanico di Catania and Monte Pellegrino, Sicily, Italy	Tadpoles reported as showing incomplete albinism. A young individual from Catania with incomplete albinism is additionally shown in a photograph.	Young individual only
Guadagna, 2022	Villa Trabia, Palermo, Sicily, Italy	One newly metamorphosed individual reported as showing complete albinism, with uniformly light yellow colouration and slight rosy shades.	Yes
This study	Gibellina, Trapani, Sicily, Italy	One metamorph showing pale yellow-pinkish colouration, faded reddish eyes, and a faint dorsal pattern consistent with the striped phenotype.	Yes



Fig. 1 - Dorsal pattern variation in normally pigmented adult *Discoglossus pictus* from Sicily, the hypopigmented metamorph reported in this study, and its observation site: A-B) spotted phenotype, male and female, respectively; C) phenotype with weakly marked spots, female; D) striped phenotype, female; E-F) newly metamorphosed hypopigmented individual, dorsal and lateral views, respectively; G) small temporary pond within the urban perimeter of Gibellina, Trapani Province (Sicily, Italy), where the hypopigmented individual was observed. / Variazione del pattern dorsale in individui adulti normalmente pigmentati di *Discoglossus pictus* provenienti dalla Sicilia, individuo neometamorfosato ipopigmentato descritto nel presente studio e sito di osservazione: A-B) fenotipo maculato, rispettivamente maschio e femmina; C) fenotipo con macchie debolmente marcate, femmina; D) fenotipo striato, femmina; E-F) individuo neometamorfosato ipopigmentato, rispettivamente in vista dorsale e laterale; G) piccolo stagno temporaneo situato all'interno del perimetro urbano di Gibellina, provincia di Trapani (Sicilia, Italia), nel quale è stato osservato l'individuo ipopigmentato. (Photo: / Foto: (A, C) Matteo R. Di Nicola; (B, E, F) Francesco P. Faraone; (D) Salvatore Russotto; (G) Federico Marrone).