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THE FIRST RECORDS OF ALBINISM IN SEVERAL COLUBRIDAE SPECIES IN UKRAINE

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The First Records of Albinism in Several Colubridae Species in Ukraine. Marushchak, O. Yu., Smirnov, N. A., Hrynchyshyn, T. Yu., Nekrasova, O. D., Koval, N. P., Horbey, O. Ya., Bakun, V. A., Pupins, M., Mykytynets, H. I., Vlašin, M., Shorokhov, O. S., Shevchuk, V. O., Khomyn, I. G., Georges, J.-Y.— Abnormal colouration in reptiles, such as melanism, albinism and leucism, provides important insights into ecological stress, genetic variability and population dynamics in reptiles, a group of vertebrates that reacts to various environmental stresses early on. This study presents the first documented cases of albinism and leucism in Colubridae snakes in Ukraine, providing new data for the wider European context. Between 2000 and 2025, eight cases of colouration anomalies were recorded: four in Aesculapian snakes (*Zamenis longissimus* (Laurenti, 1768)), three in dice snakes (*Natrix tessellata* (Laurenti, 1768)) and one in a grass snake (*Natrix natrix* (Linnaeus, 1758)). These observations were supported by photographic or video evidence and primarily occurred in two localised regions: Zakarpattia for *Z. longissimus* and the Dniester estuary for *N. tessellata*. One albino *Z. longissimus* specimen was successfully kept in captivity, enabling long-term observation of its growth and behaviour. These findings suggest the presence of local concentrations of recessive alleles and imply that environmental pressures could perpetuate such traits. Our data enrich current knowledge of herpetological diversity and colouration anomalies in Eastern Europe, highlighting the value of long-term monitoring and citizen science in biodiversity research.

Key words: *Natrix*, *Zamenis*, snakes, leucism, Eastern Europe, abnormal colouration.

Introduction

Body colour plays an important role in the lives of organisms. In animals, it affects their ability to be detected and identified, as well as how they interact with each other and their environment. This has significant implications for their survival and fitness, especially for ectotherms such as amphibians and reptiles, whose body colour also influences how they regulate their body temperature in response to sunlight (Vences et al., 2002; Sanabria et al., 2014; Stuart-Fox et al., 2017; Martínez-Freiría et al., 2020; Smith et al., 2021). Therefore, studying the colour variations in these organisms contributes to better understanding their phenotypic flexibility and ability to adapt to different environments (Boero, 2013; Kolenda et al., 2017). At the same time, investigating body colour patterns helps us to assess cases of local ecosystem imbalance, since colouration anomalies have been reported to result from damaging anthropogenic pressure (Marushchak et al., 2021). In Ukraine, such morphological abnormalities have been increasingly reported in nearly all amphibian and reptile populations in recent years likely due to habitat degradation (Henle et al., 2017; Reshetylo et al., 2019; Palamarenko, 2020). It is crucial to document these body colour abnormalities to better understand their potential causes and consequences (Nekrasova and Marushchak, 2023).

Body colour results from the types, the quantity and the distribution of pigment cells in their skin's dermis (Frost-Mason et al., 1994; Nilsson Sköld et al., 2012). The main pigment cells are: (1) xanthophores, which produce yellow or reddish pigments (xanthine); (2) iridophores, which contain crystalline chromatophores that scatter blue wavelengths, creating blue or iridescent effects (Bagnara et al., 2007); and (3) melanophores, which contain melanin, a brown or black pigment. Unlike mammals, which only have melanophores, reptiles additionally have erythrophores, making their pigmentation more complex (Prüst, 1984; Bechtel, 1995). Disruptions to pigment synthesis or pigment cell function, whether genetic or environmental, can lead to colour abnormalities (Frost-Mason et al., 1994). For instance, a malfunction in melanophores can lead to a paler appearance (due to reduced activity) or a white,

yellowish, and even pinkish colour in the case of complete lack of melanophore activity. This may affect either parts of the body or the entire body, as seen in albinism or leucism, or appear in patches, as in mosaic albinism (Nekrasova, 2008).

Albinism is a form of pigmentation disorder resulting from a lack or significant reduction of melanin in the body. Melanin is a key pigment that contributes to skin and eye colouration (Bechtel and Bechtel, 1985; Petrenau, 2024). In reptiles, albinism refers to the absence of typical pigmentation, which is more complex than in mammals. Consequently, snakes can exhibit various forms of albinism, including complete albinism, and several partial types involving the presence of only one chromatophore type. Other forms include albinistic pinto (also known as piebaldism), leucistic albinism (leucism), amelanism (lack of melanin), and anerythrism (lack of red pigments) (Prüst, 1984; Nekrasova, 2008; Henle et al., 2017).

Currently, few cases of albino or leucistic Colubridae snakes have been reported in Europe (Petreanu, 2024). Meanwhile, no published records of abnormally coloured Colubridae snakes are known from Ukraine despite their large distribution and diversity (Nerkasova and Marushchak, 2023). The main aim of this work is to fill the gap of such cases, expanding their known geography with new records from Ukraine.

Material and Methods

The survey was conducted between 2000 and 2025 as part of a long-term monitoring of herpetofauna of Ukraine in Transcarpathia, Ciscarpathian, Volyn, Podillia, Middle Dnipro, and Black Sea regions. Additionally, records published by citizen science online platforms (e. g. iNaturalist (iNaturalist, 2025); specialized communities on social media (Animal World…, 2025; Frogs, Lizards, …, 2025; Wonderful Plants…, 2025), and obtained from third parties (local residents, colleagues, staff members of nature reserves) were used. In this case, only data accompanied with visual contents (e. g. photo- and/or video-documenting of the find) that permitted the authors identifying the species (following the general guidelines for European herpetofauna; Speybroeck et al., 2020) were considered. In particular cases, such as when the data came from a national park staff member who had dealt with similar cases in the past and provided a detailed description of the find, the record was also taken into account. In some cases, biometric measurements were provided and presented here. These included weighing with an electronic scale and measuring body and tail length with a tape measure (l = 1 mm) (Myakushko, 2022).

Results

Throughout the study, we collected eight albino/leucistic Colubridae snake specimens from three different species within Ukraine (see Table 1).

Four records were for the Aesculapian snake (*Zamenis longissimus* (Laurenti, 1768)). The first individual (total body length 37 cm, including tail length 7 cm; 11 g body mass; Fig. 1, here and further pictures see in the Appendix) was found on 06.06.2022 on the side of the road (Hozhyka street) in the town of Velykyi Bereznyi, Uzhhorod District, Zakarpattia Region — among the manor-type buildings, 240 m

from its nearest edge and 320 m from the Uzh River (by Oleh Horbey, Uzhanskyi National Nature Park). The animal had a typical albinotic colouration for snakes: a soft peach to light orange base colour all along the body with lighter blotches or speckles, appearing in creamy white to pale yellow, creating a mottled or banded appearance. The head was slightly brighter orange with more concentrated red and orange tones, especially near the snout and eyes, which were reddish-pink. The ventral part was creamy with whitish shade. All these colour peculiarities are a result of the lack of melanin. Following consultations between scientists of the Ukrainian Herpetological Society, it was decided to transfer the animal to artificial conditions, given the extremely high probability of its rapid subsequent death and the low probability of its survival in natural conditions due to its unmasking colouration (Balthasar, 1935). For this purpose, it was transported to the city of Lviv, from there to the city of Kalush, and then back to Lviv, where it was kept for the next two years. In 2024 it was transferred to Kyiv. The transportations were needed as those people who took care of the snake initially, didn't always have an opportunity to provide proper keeping due to personal reasons (work, servicing in the army etc.). Four months after the transportation the snake be-

Table 1. **Records of albino/leucistic representatives of the Colubridae family made on the territory of Ukraine**

N	Species	Date	Latitude	Longitude	Comments
1	*Z. longissimus*	06.06.2022	48.902	22.463	town of Velykyi Bereznyi, Uzhhorod District, Zakarpattia Region, 207 m a. s. l.; male.
2	*Z. longissimus*	03.06.2024	48.886	22.487	town of Velykyi Bereznyi, Uzhhorod District, Zakarpattia Region, 250 m a. s. l. (data provided by N. Koval)
3	*Z. longissimus*	11.08.2024	48.899	22.465	town of Velykyi Bereznyi, Uzhhorod District, Zakarpattia Region, 209 m a. s. l. (data provided by N. Koval)
4	*Z. longissimus*	2008	49.911	23.748	village of Ivano-Frankove, Yavorivskyi District, Lviv Region (data provided by I. Khomyn & V. Strus)
5	*Natrix natrix* (Linnaeus, 1758)	21.09.2010	51.068	25.583	village of Starosillia, Lutskyi (formerly Manevytskyi) District, Volyn Region (data provided by O. Kuts)
6	*Natrix tessellata* (Laurenti, 1768)	06.2021	46.061	30.441	village of Zatoka, Bilhorod-Dnistrovskyi District, Odesa Region (data provided by I. Khoma)
7	*N. tessellata*	18.07.2018	46.402	30.249	village of Maiaky, Odeskyi District, Odesa Region, on the lyman's coast, Dniester lyman (data provided by O. Nekrasova).
8	*N. tessellata*	16.06.2025	49.717	31.546	village of Pekari, Cherkaskyi District, Cherkasy Region, on the river bank of Dnipro River (data provided by local resident (T. Moroz) with video-confirmation)

gan to feed on its own, accepting 1 pinkie (newborn mouse) every week, previously being force-fed only. In present time (May 2025), this individual was 85 cm long for 103 g body mass (Fig. 2).

The second albinotic *Z. longissimus* (> 1 m body length, identified from a smartphone video validated by the authors; Fig. 3) was found on 03.06.2024 in the Zakarpattia Region, Uzhhorod District, village Velykyi Bereznyi on the roadside near the edge of a beech forest it was found by S. S. Olen of the Uzhanskyi National Nature Park.

The third record of an albinotic/leucistic *Z. longissimus* (body length > 1 m) was reported on 11.08.2024 in the town of Velykyi Bereznyi, Uzhhorod District, Zakarpattia Region, under a piece of tin near a private house (by O. V. Kuvik, Uzhanskyi National Nature Park). Based on the description made by our colleague, it was assumed that it was an albino Aesculapian snake, yet no photo- or video- records were provided for this case.

The fourth record of albinotic *Z. longissimus* was made following the photo (Fig. 4), that is placed in the administration building of Strict Nature Reserve "Roztochya". The photo was taken by I. Khomyn in 2008 (unfortunately the original of the photo was lost). Following the visible morphological peculiarities (e. g. well-seen speckling along the body, form of the head, and yellow spots behind the head, which are combined characteristics of Aesculapian snake's neonates) as well as the locality, which is known to be inhabited by the species, it was concluded that the snake on the photo is actually neonate (probably hatchling, reported by the author of the photo to be < 15 cm long) of *Z. longissimus*.

The second species of abnormal coloured snake was the dice snake *N. tessellata* with three individuals.

In early June 2021, one juvenile animal was observed underwater in the Dniester Lyman in the village of Zatoka in the Bilhorod-Dnistrovskyi District of the Odesa Region (Fig. 5, by Igor Homa). The snake was caught and photographed. The red pupil and overall creamy-pink colour of body with slightly darker speckles typical for dice snake, make this individual an albino form, quite rare for this species. Another individual, it seems to be immature, was spotted in 2018 in the same area in the Dniester lyman (a channel leading from the main part of the Dniester lyman) in the vicinity of Maiaky village by the author Oksana Nekrasova. The animal was photographed (Fig. 6) in its habitat.

This specimen showed a typical example of albino morph with an orange-creamy colour of the body with red eyes and speckles of darker shade typical for this species. Its colouration, which can be seen from the photo, prevents it from properly disguising itself in the aquatic vegetation.

The third record was made in June 2025 in the Cherkasy Region, near the Kaniv nature reserve. A local resident of the village of Pekari (T. Moroz) spotted the animal twice during the month in the same location. According to the observer, the animal was white-yellow with reddish eyes, and was seen hunting small fish underwater. Based on this description and the behavioural patterns, as well as the low-quality video screenshot (Fig. 7) provided by the observer, it was concluded that this was an albino individual of *N. tessellata* — the first such record in the Middle Dnipro region.

The third species of abnormal coloured snake was represented by one record of leucistic of grass snake *N. natrix* yearling in September 2010 while inspecting a concrete well tube on the territory of a former military unit in the village of Starosillia,

Lutskyi (formerly Manevytskyi) District, Volyn Region (by O. Kuts (Onufrii Kuts, 2021), Fig. 8). The individual was photographed and released. Its white colour of the body and black eyes (Fig. 8) enables us to claim that this was a case of true leucism.

Discussion

As of now, 45 cases of Colubridae representatives that have been recorded and identified to species level are known in the territory of the European Union (EU) (Petreanu, 2024) (Table 2). Overall, the small number of Colubridae snakes showing

Table 2. **Number of records of albinotic or leucistic Colubridae snakes from EU (most cases, though being reported in separate articles, are presented following the review of Papezikova et al. (2020)**

Species	Vernacular name	Country	N cases	Reference
Z. longissimus	Aesculapian snake	Austria	3	(Krofel, 2004; Ćurić, 2019; Papezikova et al., 2020; Meier et al., 2021; Vlašin, 2023)
		Slovakia	3	
		Czech Republic	2	
		Switzerland	2	
		Bosnia and Herzegovina	1	
		Italy	1	
		Slovenia	1	
		Serbia	1	
Conella austriaca Laurenti, 1768 (6 records)	Smooth snake	Austria	1	(Papezikova et al., 2020)
		Czech Republic	2	
		Italy	1	
		Neatherlands	1	
		Slovakia	1	
Coronella girondica (Daudin, 1803)	Riccioli's snake	France	1	(Papezikova et al., 2020; Martínez-Silvestre et al., 2009)
		Spain	1	
Dolichophis jugularis (Linnaeus, 1758)	Black whipsnake	Cyprus	1	(Baier et al., 2013; Papezikova et al., 2020)
Elaphe sauromates (Pallas, 1814)	blotched ratsnake	Bulgaria	2	(Jablonski et al., 2019; Papezikova et al., 2020)
Hierophis viridiflavus (Lacépède, 1789)	Green whipsnake	Italy	1	(Papezikova et al., 2020)
Natrix helvetica (Lacépède, 1789)	Barred grass snake	France	2	(Varanguin, 2012; Papezikova et al., 2020)
		Great Britain	2	
N. natrix	grass snake	Austria	1	(Papezikova et al., 2020)
		Czech Republic	1	
		Germany	1	
		Poland	1	
Natrix maura (Linnaeus, 1758)	Viperine snake	Spain	5	(Alaminos and López, 2011; Papezikova et al., 2020)
N. tessellata	Dice snake	Slovakia	5	(Papezikova et al., 2020)
		Italy	1	

albinism and leucism are extremely rare in Ukraine, as well as in Europe (Petreanu, 2024). This strongly contrasts with cases of melanism that have been much more observed for various snake species during decades of research in different regions of Ukraine (we are talking about dozens of individuals; data from O. Nekrasova and pers. comm. of O. Zinenko).

Between 2000 and 2025, we could report 8 cases of abnormal coloured Colubridae snakes, including four Aesculapian snakes, three dice snakes and one grass snake in Ukraine. With these records, the territory of Ukraine is now included in the map of abnormally coloured snakes' records of Europe (Fig. 9).

Such observations are highly anecdotal due to the low probability of encountering these discrete species in the wild, and the even lower proportion of abnormal coloured individuals in wild populations. For the Aesculapian snake, the number is similar to the highest values reported for other countries in Europe (Austria, Czech Republic, Slovakia; Sochurek, 1955; Vlašín, 2023; Balthasar, 1935). Considering the large size of Ukraine compared to these two countries, one may consider that cases of albinism are rarer than in the other countries. However, this may actually be the opposite since these 3 albinotic Aesculapian snakes were all found in the only town of Velykyi Bereznyi (Zakarpattia Region). It also may that the two observations (ind. #2 and #3) were actually from the same individual, since none could be captured, so no manipulation nor close observation was possible for comparison. Most importantly, based on its size, the first reported albino Aesculapian snake was a young individual, showing that more individuals may occur through reproduction. It seems that the chances for phenotype to become established in the local population in Velykyi Bereznyi town are higher than in other places. This suggestion makes this locality really unique. A similar situation seems to happen in Dniester lyman where the albinotic *N. tessellata* were spotted in 2018 (immature) and 2021 (juvenile). It is suggested that albino genes here managed to survive in adult specimens that managed to breed and give the next generations of descendants.

Conclusions

The fact that albino/leucistic individuals are less frequently observed in the wild may be due to a lower genetic probability of their occurrence. In our study, we had the opportunity to capture a young albino Aesculapian snake (ind. #1). Interestingly, this individual had a very low body mass, suggesting very low predatory success, possibly due to its inability to properly disguise itself for efficient hunting. In the long term, such poor predatory skills will most likely lead to premature death, resulting in the aforementioned low probability of occurrence and observation. The fact that albino individuals in the wild exhibit such low predatory efficiency is supported by the observation that, once brought into a captive facility, these individuals could recover normal body growth. Accordingly, we suggest that such individuals should be removed from the wild when spotted, in order to save their lives and provide them with proper care in accordance with a responsible herpetoculture (terrariumistics) approach. Such actions will provide the necessary basis for breeding rare morphs and studying the genetic nature of such cases, providing scientists with more infor-

mation on heredity and the potential causes of colouration anomalies. This information could be important for bioindication and assessing the state of the local environment.

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Appendix

Fig. 1. Photo of the initial find of albino *Z. longissimus* within the town of Velykyi Bereznyi (Zakarpattia Region, 06.06.2022; photo by O. Ya. Horbey)

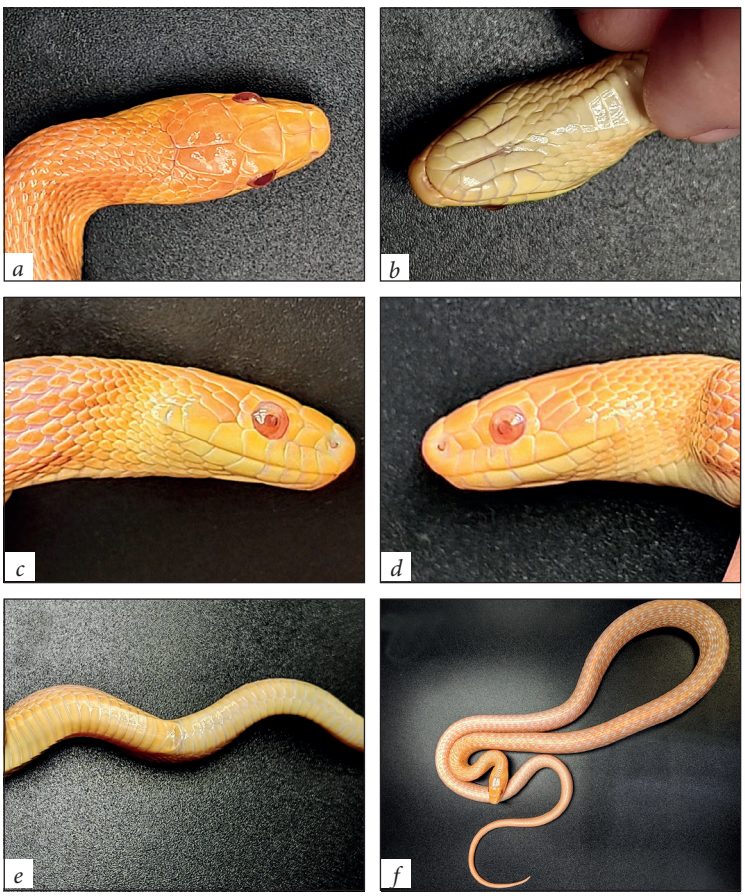

Fig. 2. Current state (May 2025) of the first *Z. longissimus* individual found on 06.06.2022 in Zakarpattia Region (photo by O. Yu. Marushchak & A. Yu. Vlasenko): *a* — head scalation, dorsal view; *b* — head scalation, ventral view; *c* — head scalation, right side; *d* — head scalation, left side; *e* — preanal scalation; *f* — general appearance

Fig. 3. The second record of albinotic *Z. longissimus* found in the town of Velykyi Bereznyi, Zakarpattia Region (03.06.2024, screenshot from a video by S. S. Olen)

Fig. 4. The fourth record of albinotic *Z. longissimus* found in the village of Ivano-Frankove, Lviv Region (2008, screenshot of a photograph made by I. Khomyn and placed in the administration building of Strict Nature Reserve "Roztochya")

Fig. 5. The record of albinotic *N. tessellata* in the village of Zatoka, Odesa region (June 2021, photo by Ihor Khoma)

Fig. 6. The record of albinotic *N. tessellata* in the village of Maiaki, Odesa Region (July 2018, photo by Oksana Nekrasova)

Fig. 7. The record of albinotic *N. tessellata* in the village of Pekari, Cherkasy Region (June 2025, screenshot from a video provided by T. Moroz)

Fig. 8. The record of leucistic *N. natrix* in the village of Starosillia, Volyn region (21.09.2010, photo by O. Kuts)

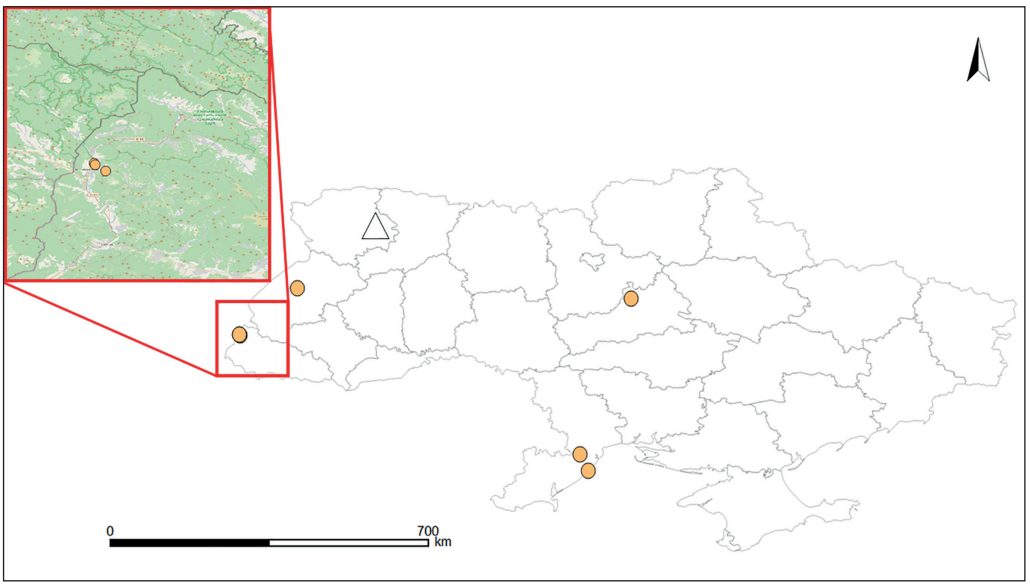

Fig. 9. Map of records of albino (orange circles) and leucistic (white triangle) Colubridae species in Ukraine in XXI century