First record of an albino lactating female of *Rhinolophus hipposideros* (Bechstein, 1800)

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Melanin deficiency is rare among vertebrates, and chromatic disorders in bats are considered exceptional. Among these, albinism is a hereditary condition caused by mutations affecting melanin synthesis, resulting in white fur and red eyes. Although albinism has been documented in several bat families around the world, records for the Lesser horseshoe bat (*Rhinolophus hipposideros*) remain scarce and mostly confined to Central Europe. We report the first documented case of albinism in R. hipposideros in Italy, observed in 2025 along the Adriatic coast of the province of Lecce. The albino individual, a lactating female with red eyes and completely white fur, was found within a nursery colony of approximately 172 individuals roosting in an artificial cavity. The bat exhibited normal behaviour and was observed carrying a normally pigmented pup, suggesting possible successful reproduction and apparent social integration based on the available observations. This observation represents one of the southernmost records of albinism in lesser horseshoe bat and provides rare evidence that this condition does not necessarily impair reproductive activity or social behaviour under sheltered roosting conditions. Further studies are needed to assess the potential effects of albinism on fitness and survival in bats.

Keywords: Italy, Chiroptera, albinism, lesser horseshoe bat.

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Melanin deficiency is rare among vertebrates, and chromatic disorders in bats are considered exceptional. Among these, albinism is a hereditary condition caused by mutations affecting melanin synthesis, resulting in white fur and red eyes. Although albinism has been documented in several bat families around the world, records for the Lesser horseshoe bat (*Rhinolophus hipposideros*) remain scarce and mostly confined to Central Europe. We report the first documented case of albinism in *R. hipposideros* in Italy, observed in 2025 along the Adriatic coast of the province of Lecce. The albino individual, a lactating female with red eyes and completely white fur, was found within a nursery colony of approximately 172 individuals roosting in an artificial cavity. The bat exhibited normal behaviour and was observed carrying a normally pigmented pup, suggesting possible successful reproduction and apparent social integration based on the available observations. This observation represents one of the southernmost records of albinism in lesser horseshoe bat and provides rare evidence that this condition does not necessarily impair reproductive activity or social behaviour under sheltered roosting conditions. Further studies are needed to assess the potential effects of albinism on fitness and survival in bats.

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Deficiency in melanin production is a rare phenomenon among vertebrates (Bernardi *et al*., 2019), and atypical pigmentation in bats is considered extremely uncommon (Cichocki *et al*., 2017; Lucati & López-Baucells, 2017). Consequently, scientific interest in chromatic disorders in bats has increased worldwide, and the number of documented cases continues to grow around the world (Bernardi *et al*., 2019; Cichocki *et al*., 2017; Gaisler *et al*., 2011; Leal *et al*., 2021; López-Baucells *et al*., 2013; Lucati & López-Baucells, 2017; Murariu & Chisamera, 2006; Smirnov *et al*., 2014; Zalapa-Hernández *et al*., 2016; Zortéa & Cristina Silva, 2017). Several forms of abnormal body pigmentation may arise from reduced or altered melanin production, generally classified as true albinism, leucism, piebaldism, melanism and hypomelanism (Lucati & López-Baucells, 2017). All these pigmentation disorders are hereditary and originate from genetic mutations affecting melanin synthesis (Møller *et al*., 2013; Utzeri *et al*., 2016). It has also been suggested that piebaldism tends to occur more frequently in small or isolated populations (Bensch *et al*., 2004). Among these conditions, albinism is a well-defined inherited hypopigmentary disorder characterised by a complete lack of melanin. The

mutation in genes encoding the enzyme tyrosinase, due to an autosomal recessive trait (van Grouw, 2006), leads to pale skin, white fur or feathers, and red eyes (Hofreiter & Schöneberg, 2010; van Grouw, 2006).

Albinism has been recorded on all continents where bats occur (Zortéa & Cristina Silva, 2017). The review by Lucati & López-Baucells (2017) showed that chromatic disorders in bats have been observed across a broad diversity of species and ecological contexts. Based on 609 individual bats examined, Lucati and López-Baucells (2017) reported 269 cases of piebaldism, 152 of albinism, 94 of melanism, 20 of hypomelanism, 11 of leucism, and three of hypomelanism; while in 60 cases the chromatic disorder remained undetermined. The list of albino bats in the world formulated by Zortéa & Cristina Silva (2017), reported 25 species with the Vespertilionidae family having the largest number of albinism cases. This observation is likely explained by the fact that most research efforts on bats have historically focussed on this taxonomic group. Moreover, the Vespertilionidae family is cosmopolitan and exhibits the highest species richness across several regions, including Europe and the United States. In the Neotropics, where the dominant family is Phyllostomidae, most records of albinism were also found within this group. Therefore, beyond historical differences in research intensity, the higher number of albinism cases reported within a family may also reflect its greater species richness (Zortéa & Cristina Silva, 2017). In the same list of albino bats, as also reported by Uieda (2000), the family Rhinolophidae is also represented. Documented cases include *Rhinolophus euryale* from France and *Rhinolophus hipposideros* from Slovakia. Three additional cases involving *Rhinolophus hipposideros* were reported by Gaisler *et al*. (2011) from the Moravian Karst (Czech Republic). With these records, albinism in this species can be regarded as relatively frequent (Uieda, 2000). Several occurrences have been documented in the Czech Republic and Slovakia, probably due to the large local populations of this species, whereas *R. hipposideros* is less common in Western Europe and some Mediterranean countries, such as Italy (Crucitti & Cavalletti, 2002). An alternative explanation for the higher frequency of albinism in Central Europe may relate to the low genetic variability of the species in this region (see Gaisler *et al*., 2011). In Slovakia, a mating pair of albino individuals was documented, while the only reported observation of copulation in Czech territory appears to have been made in northern Moravia (Danko, 1995). Finally, a white-coloured juvenile, probably a leucistic or piebald individual, was observed clinging to its mother in a summer colony located in a church spire in eastern Slovakia (Danko, 1995).

The observation of the albino *Rhinolophus hipposideros* (Bechstein, 1800) was made in the province of Lecce, southern Italy, along the Adriatic coast (Fig. 1). The individual was first detected by a local speleologist, who subsequently reported the case to our association. Field observations were carried

out on two occasions, on 19 and 29 July 2025, at the same site, an artificial cavity created during a land restoration operation which opens directly to the sea. Inside the cavity, a nursery colony of *R. hipposideros* was present, consisting of approximately 172 individuals (Fig. 2).

During each visit, the colony was observed for a limited period in order to minimise disturbance to roosting individuals. At first, the individual was roosting near the centre of the colony, displaying no visible behavioural deviations from other individuals. Later, the albino bat moved to a more exposed position, which made it possible to photograph the individual while hanging from the wall. The individual was a lactating female carrying a normally pigmented pup (Fig. 3), indicating that the albino female was actively reproducing within the colony. The bat appeared completely white, with noticeably red eyes, features that are consistent with a case of albinism. However, as no genetic or histological analyses were conducted, alternative pigmentation disorders cannot be definitively excluded.

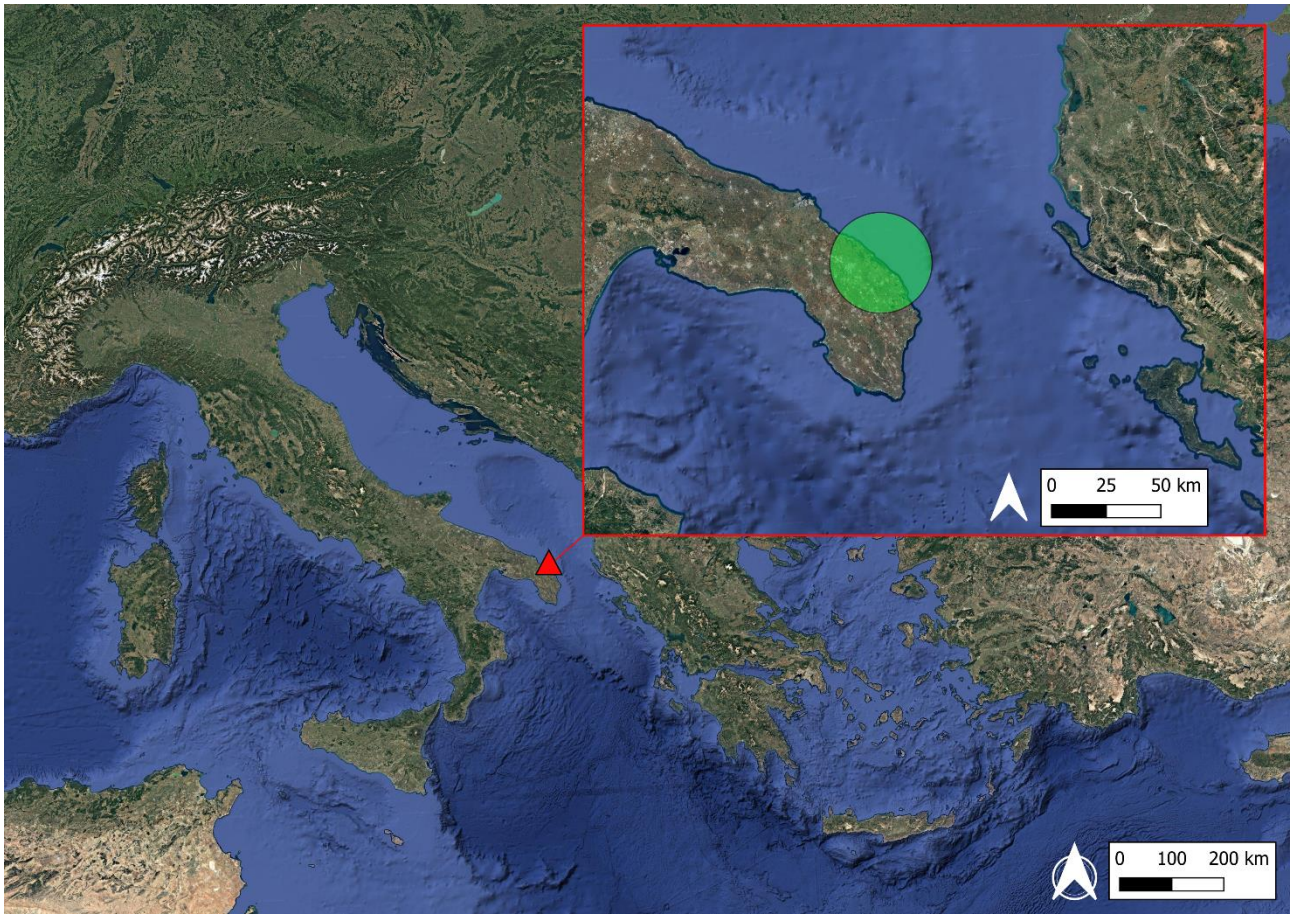

Figure 1 - Approximate location of the artificial cavity where the albino bat was found, in southern Italy (province of Lecce).

Figure 2 - Nursery colony of *Rhinolophus hipposideros* inside the artificial cavity (left). The enlarged view shows the albino lactating female among the other individuals (right).

Figure 3 - Lactating female carrying a pup attached to her abdomen (left). Close-up view of the same female showing the characteristic features of albinism (right).

Other records of albino females carrying pups, as well as observations of juvenile albino bats, have been reported from various parts of the world (Leal *et al*., 2021; Sánchez-Hernándes *et al*., 2010). Cases of albinism within reproductive colonies have also been documented in Poland for several species, including *Myotis nattereri*, *Myotis myotis*, and *Eptesicus serotinus* (Cichocki *et al*., 2017), as well as a record of an albino *Rhinolophus hipposideros* within a breeding colony in the same country (Ruprecht, 1965). In Europe, further cases involving *R. hipposideros* have been described in Slovakia and in the Czech Republic where a mating pair was reported (Danko, 1995), although no evidence of successful reproduction was documented. Finally, a white-coloured juvenile of *R. hipposideros*, probably a leucistic or piebald, was observed clinging to its mother in a summer colony located in a church spire in eastern Slovakia (Danko, 1995). In Italy, no previous cases of albinism have been reported for *R. hipposideros*, and to date, this represents the first observation of a lactating albino *R. hipposideros* female with a pigmented pup in Italy.

Several observations of albino bats have been conducted worldwide to investigate both the behaviour and the responses of conspecifics within the colony. Uieda (2001) discussed these aspects in *Desmodus rotundus* and reported multiple observations from other authors on various species, including *Myotis lucifugus*, *Myotis macrodactylus*, and *Rhamdella minuta*. The results are contrasting: in some cases, other individuals appear to perceive differences in albino bats, while in others, albinism seems to have no significant effect on social dynamics. The influence of albinism on individual fitness in bats needs further evaluation, since lack of pigmentation could represent a potential disadvantage in natural habitats (Uieda, 2000; Acevedo *et al*., 2009). However, nocturnal behaviour in bats appears to mitigate the effects of pigmentation loss, with minimal impact on survival (Bernardi *et al*., 2019). Moreover, caves and sheltered roosts provide protection from sunlight, water loss, and visually hunting predators, thus enhancing the likelihood of survival for albino individuals (Uieda, 2001). In our observation, the albino female appeared integrated within the group and showed no abnormal behaviour compared to other individuals, as indicated by her roosting position near the centre of the colony. Moreover, she was also observed carrying a normally pigmented pup, confirming reproductive activity at the time of observation. These findings suggest that, under the sheltered conditions of this roost and within the limits of short-term observations, albinism did not appear to prevent social association or reproductive activity.

This represents the first documented case of albinism in *R. hipposideros* in Italy and one of the southernmost records in Europe. The observation confirms that albinism can also occur in Mediterranean populations of this species, and that, in this case, it did not appear to impair the individual's reproductive activity. Nevertheless, further studies are needed to assess the potential effects of albinism on survival, fitness, and social interactions in other colonies and under different

environmental conditions. Nevertheless, further research is warranted to evaluate the potential effects of albinism on survival, fitness, and social interactions across additional colonies and under varying environmental conditions. As previously suggested (Danko, 1995), albinism may also be linked to reduced genetic diversity, an aspect that deserves targeted investigation in future studies.

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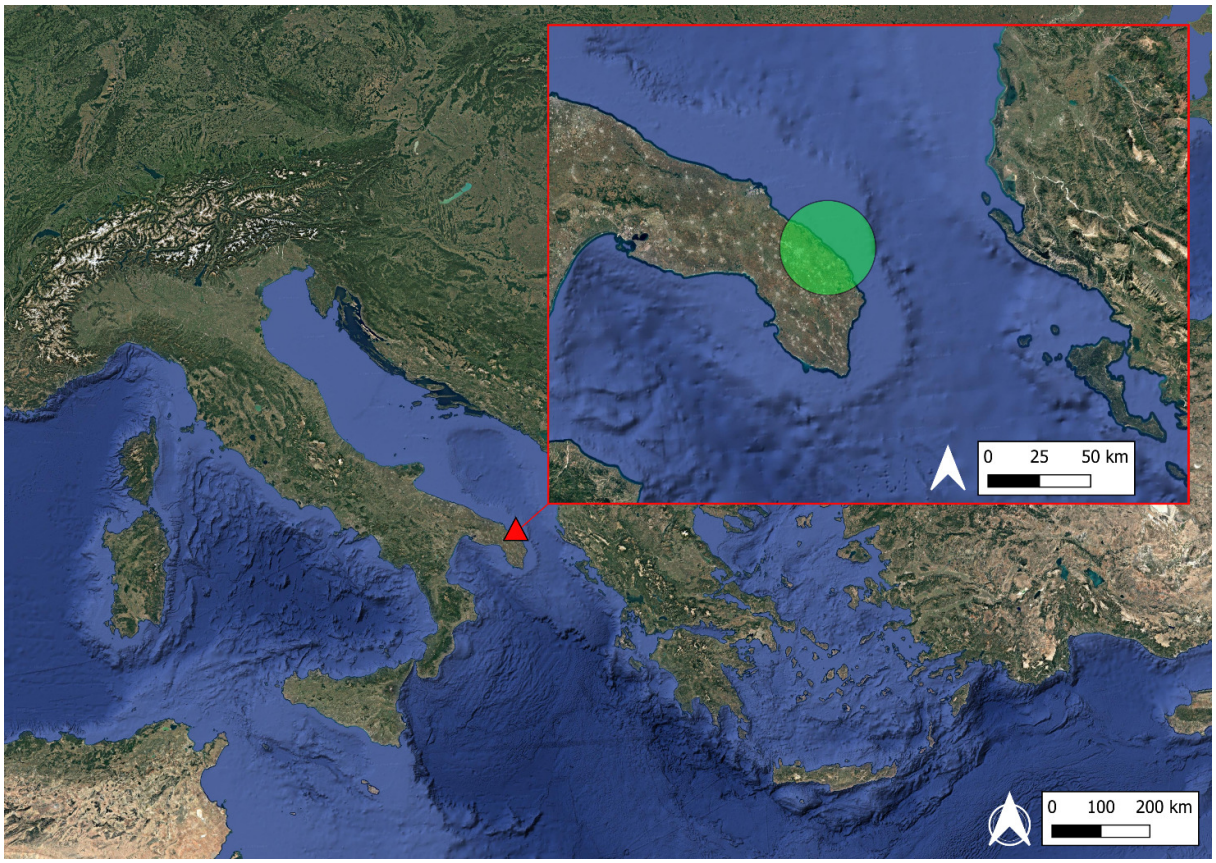

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