Short Note

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First record of a white phenotype Egyptian weasel (*Mustela subpalmata*) in Tahta, Sohag, Egypt

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Abstract: Aberrant pelage colourations have been occasionally detected in carnivores, including mustelids. However, to our knowledge, no cases of leucism have been reported in the genus *Mustela* to date. On May 1, 2024, an Egyptian weasel (*Mustela subpalmata*) killed by locals was discovered and photographed in the town of Tahta, Egypt. The specimen exhibited predominantly white fur on its left side and head. Although eye colour was not inspected, the normal lip colouration, dirty white fur hue, and dark brown tail tip suggest a case of leucism rather than albinism. Leucism is often linked to inbreeding caused by population isolation or size reduction, which could arise through urban development, considering that roads can act as social and physical barriers to gene flow. Genetic studies are needed to elucidate the population dynamics and conservation implications for urban Egyptian weasels.

Keywords: albinism; Egyptian weasel; genetic mutation; human–wildlife conflicts; hypopigmentation; leucism

Coat colouration in mammals reflects evolutionary adaptations for physiological functions, intra- and interspecific communication, as well as camouflage (Caro 2005). The colouration of mammalian pelage is primarily caused by the pigment melanin (Caro 2013). Occasionally, genetic anomalies lead to either an excess or a deficiency of pigment, resulting in abnormal fur colouration conditions such as melanism, albinism, leucism, and erythrism (Acevedo and Aguayo 2008; Delibes et al. 2013; Pirie et al. 2016). Melanism, caused by an excess of melanin, results in a darker coat colouration (Hedges et al. 2015; Wood et al. 2022). In contrast, albinos are characterized by a complete absence of melanin, resulting in an almost pure white coat and pink lips, nose and eyes (Miller 2005; Summers 2009). In between these two extremes, leucism involves a partial loss of melanin which causes an individual to appear white or cream white, but some individuals may also have patches of normal colouration mixed with white or pale areas. Eye and nose colour and that of the feet, however, is not affected (Fertl and Rosel 2002; Hofmeester et al. 2021). Erythrism, also due to a melanin deficit, causes the animal to appear reddish compared to the normal phenotype (Laacke et al. 2006). These colourations often result from single mutations in specific genes and are more common in isolated and genetically homogenous populations (Hubbard et al. 2010; Majerus and Mundy 2003). For example, leucism is frequently linked to recessive mutant alleles (Bensch et al. 2000), which can lead to the inability of the body to produce tyrosinase, an enzyme necessary for melanin biosynthesis (Sánchez-Ferrer et al. 1995). The inhibition of melanin production can also be associated with pleiotropic effects, where a single gene mutation can influence multiple phenotypic traits (Searle 1990).

Few studies have highlighted the adaptive benefits of atypical coat colours (e.g., Graipel et al. 2019; Hubbard et al. 2010). According to Caro (2005), this is likely because these anomalies are rare and natural selection disfavours these coat variations. Generally, abnormal colouration poses challenges for animals, because it can hinder communication or negatively impact breeding success (Caro 2005; Graipel et al. 2019). It can also make them more noticeable to predators (Parsons and Bonderup-Nielsen 1995) or prey (Caro 2005). To investigate coat colour anomalies, as well as their causes and consequences more effectively, scientists must document aberrant colouration to determine its frequency and locations in wild populations – as recommended recently by other authors (Hofmeester et al. 2021; Ross et al. 2022).

The Egyptian weasel (*Mustela subpalmata* Hemprich and Ehrenberg, 1833) is a mustelid endemic to Egypt. It is found at high densities in anthropogenic landscapes

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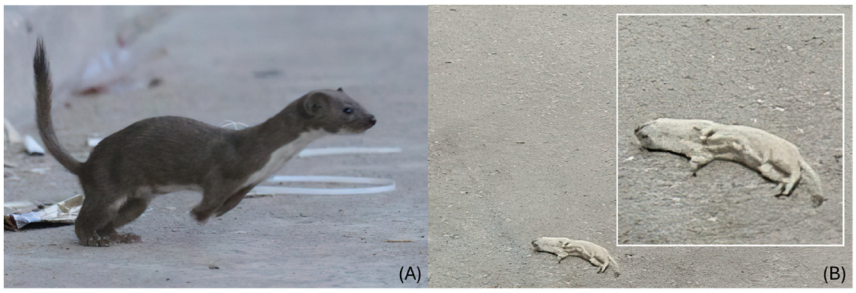

Figure 1: A comparison of two coat colourations in Egyptian weasel: (A) Typical colouration characterised by a chestnut brown dorsal pelage and white to creamy-yellow underparts (photograph © Dick Hoek); (B) white phenotype individual recorded in Tahta, Sohag, Egypt (photograph © Mohamed G. Awad).

(Rizk et al. 2019) and its latest conservation status in the *IUCN Red List of Threatened Species* was evaluated as Least Concern (McDonald and Do Linh San 2016). The Mammal Diversity Database (2024) regards it as a subspecies of the least weasel (*Mustela nivalis*) following Rodrigues et al. (2016), but genomic studies are needed to confirm this classification. The coat colour of the Egyptian weasel is distinctive, with the ventral pelage being white to creamy-yellow and the dorsal pelage dull chestnut brown (Figure 1A), occasionally dotted with brown spots arranged in individually identifiable patterns (McDonald 2013). The tail is sometimes of a darker brown than the body, or only its tip (Figure 1A). Albinism, leucism, melanism or other type of colouration anomalies have not been previously described in the Egyptian weasel. In this note, we report the first recorded instance of an Egyptian weasel with a white coat colour. We attempt to identify the type of colouration anomaly it most likely corresponds to and discuss its possible causes.

Tahta (26°46′ S, 31°29′ E) is a town located on the western bank of the Nile in the Sohag Governorate of Egypt. It has a subtropical desert climate (Classification: Hot desert climates (BWh)) (Kottek et al. 2006), characterized by hot summers and mild winters. August is the warmest month, with an average temperature of 38.76 °C, while January is the coldest, with an average temperature of 7.76 °C. May is the wettest month, with an average precipitation of 0.45 mm. The average annual humidity stands at 32.8 % (source: https://weatherandclimate.com/egypt/sohag/tahta).

On May 1, 2024, MGA photographed a deceased white Egyptian weasel in the Tahta area of Egypt, on Ahmed Anber Street (Figure 1B), shortly after a member of his neighbourhood had killed the animal. As a local resident, MGA further noted that citizens of Tahta often kill weasels due to their reputation as harmful animals that prey on chickens, ducks, and pets like pigeons.

Upon examining the image, clear differences in colouration from a typical weasel are observed. The entire left side of the animal is distinctly white. Additionally, MGA observed that the entire head was white. Unfortunately, the nose and eyes are not visible in the picture, and because MGA is not a biologist, he did not pay attention to their colour. Based on these observations, this could indicate that this anomaly is related to albinism or leucism. However, as the lips appear to be normal in colour, the fur colouration is more of a dirty white than pure white and the tail appears to have retained its dark brown colour at its tip, it seems more likely that this animal is leucistic. The animal cannot be erythristic because its coat does not have reddish tinges (Laacke et al. 2006).

Leucism is very rare in nature. Olson and Allen (2019) reported 34 studies – including their own – documenting leucism in the order Carnivora, with 19 of these cases occurring only in 3 Mustelidae species: the fisher (*Pekania pennanti*), the tayra (*Eira Barbara*) and the neotropical otter (*Lontra longicaudis*). Interestingly, this means that over half of the reported instances of leucism in carnivores involve mustelids. Their review did not include a recent record of a leucistic European badger (*Meles meles*) (Hofmeester et al. 2021). The occurrence of leucism has been associated with inbreeding, which increases the likelihood of white phenotypes (Bensch et al. 2000; Owen and Skimmings 1992). Additionally, environmental factors such as nuclear pollution have been linked to an accelerated pace of mutations, contributing to leucism (Møller and Mousseau 2001). Colour anomalies are generally detrimental to an individual's survival and, in our case, humans were the primary cause of death. This is supported by Owen and Skimmings (1992), who noted that individuals with abnormal colouration are more likely to be targeted by hunters and poachers.

Although the cause of the leucistic weasel in Tahta City is unknown, several factors may have contributed to its occurrence. Wakil (1932), based on Rüppel (1826), noted that least weasels were introduced to Egypt in the first half of the 19th century to control rats and combat plague. This could have artificially resulted in low genetic diversity through the founder effect, increasing the likelihood of rare phenotypes manifesting (Hubbard et al. 2010). Rodrigues et al. (2016), in their genetic study of the taxonomic status and origin of the Egyptian weasel, could not discard the introduction scenario. However, they suggested that the genetic patterns observed, along with the weasel fossil record in Israel and the unique commensal lifestyle of the Egyptian weasel, rather support the hypothesis that the Egyptian population is a remnant of a historical range expansion of the least weasel from Israel into Egypt. Nevertheless, even in this alternative scenario, the founder effect may have played a role in

restricting the genetic diversity of the weasel population from Egypt. Considering more recent causes, urban development and roads can act as social and physical barriers to gene flow (Dickson et al. 2005; Riley et al. 2004; Tigas et al. 2002), reinforcing inbreeding and thereby raising the chances of mutations leading to colour anomalies. More recently, numerous observations on social media, including videos and posts, show weasels being killed by humans (F. Hayder pers. obs. 2024), which could also impact weasel populations and contribute to this anomaly. Both urbanisation and human–weasel conflict favour population isolation and small population sizes, which is known to increase the occurrence of leucism (Bensch et al. 2000). Genetic analyses conducted on Egyptian weasel populations living in urban areas could reveal whether these weasels indeed suffer from low genetic diversity.

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