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# Record of piebaldism in *Dicotyles tajacu* (Artiodactyla: Tayassuidae) in northeast San Luis Potosi, Mexico

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## Abstract

Phenotypic variations occur naturally in vertebrates. These variations are related to environmental, physiological, and genetic factors. Most variations in the pigmentation of the integument (skin, hair, feathers, scales, nails, etc.), or chromatic anomalies, originate due to the inheritance of an altered copy of genes related to the production of tyrosinase and melanin synthesis. Chromatic anomalies are classified as piebaldism, leucism, albinism, and melanism. This work presents the first record of piebaldism in the collared peccary (*Dicotyles tajacu*) in northeastern Mexico, being only the second record in the entire range. This finding was made during a monitoring conducted in 2023 at a site adjacent to the Sierra del Abra Tanchipa Biosphere Reserve, in northeastern San Luis Potosi, Mexico. This record contributes to the understanding of the distribution of chromatic anomalies in the Neotropical region, as well as their possible ecological implications.

Key words: chromatic anomalies, collared peccary, Neotropical region, piebaldism.

## Resumen

Las variaciones fenotípicas ocurren de manera natural en los vertebrados. Estas variaciones se relacionan con factores ambientales, fisiológicos y genéticos. La mayoría de las variaciones en la pigmentación del integumento (piel, pelo, plumas, escamas, uñas, etc.), o anomalías cromáticas, se originan debido a la herencia de copias alteradas de genes relacionados con la producción de tirosinasa y síntesis de melanina. Las anomalías cromáticas se clasifican como piebaldismo, leucismo, albinismo y melanismo. En este trabajo se presenta el primer registro de piebaldismo en el pecarí de collar (*Dicotyles tajacu*) en el noreste de México, siendo apenas el segundo registro en toda su distribución. Este hallazgo se realizó durante un monitoreo realizado en 2023 en un sitio adyacente a la Reserva de la Biosfera Sierra del Abra Tanchipa, en el noreste de San Luis Potosí, México.

Este registro contribuye a la comprensión de la distribución de anomalias cromáticas en la región Neotropical, así como sus posibles implicaciones ecológicas.

Palabras clave: anomalías cromáticas, pecarí de collar, piebaldismo, región Neotropical.

Pigmentation variability represents one of the most prominent phenotypic characteristics observed in vertebrates (Hofreiter & Schöneberg 2010). Color patterning and variation result from the integrated function of more than 150 pigmentation-related genes. Sequence mutations within these genes drive phenotypic differences in pigmentation, contributing to visual attraction, aposematism, and camouflage (Hofreiter & Schöneberg 2010; Howell et al. 2021). The diversity of coloration patterns in mammals primarily arises from the presence and distribution of specific pigments—predominantly melanin—within the integumentary system (Pawelek & Körner 1982; Lucati & López-Baucells 2016; Fertl & Rosel 2018). These coloration patterns play key roles in adaptive processes, including sexual selection, intra- and interspecific communication, susceptibility to diseases, protection, predatory success, and anti-predator defense (Caro 2005; Caro & Mallarino 2020; Howell et al. 2021).

Nonetheless, chromatic anomalies can result from either an overproduction or deficiency of melanin, manifesting as partial or complete alterations in coloration across the body (Hofreiter & Schöneberg 2010; Abreu et al. 2013). Recent zoological studies have classified chromatic anomalies as piebaldism, leucism, albinism, and melanism (Acevedo et al. 2009; Lucati & López-Baucells 2016; Fertl & Rosel 2018). However, there is no absolute consensus because some authors use different terms or adjectives such as "partial" or "total" (Lucati & López-Baucells 2016; Zalapa et al. 2016), especially in cases of hypopigmentation (i.e. piebaldism, leucism, and albinism).

Piebaldism is defined as the absence of pigmentation only in specific parts of the body, while eye color remains normal (Acevedo et al. 2009; Lucati & López-Baucells 2016). It is an autosomal dominant disorder characterized by defective melanocyte migration into the affected skin and hair follicles or feathers due to mutations in the *KIT* gene, although pathogenetic variants in the *SNAI2* gene have also been described (Finch et al. 2017; Giacaman & Martín-Santiago 2023). Individuals with chromatic anomalies, such as piebaldism, may suffer numerous visual and immunological pathologies (Summers 2009) and would be more susceptible to predation (Sazima & Di-Bernardo 1991; Parsons & Bonderup-Nielsen 1995).

Even though chromatic anomalies have been reported in several Neotropical mammals (Abreu et al. 2013; Lucati & López-Baucells 2016; García et al. 2020; Marín 2021; Cotts et al. 2023, 2024; Gallo et al. 2023; Fuentes et al. 2024), these anomalies are considered rare in free-ranging populations due to the assumed short life expectancy of animals carrying these traits (Silva et al. 2020). In wild ungulates there are several records of chromatic anomalies, including cervids such as Amazonian brown brocket (*Passalites nemorivagus* Mejía-Valenzuela & Auz-Cerón 2020; Guastalla et al. 2021), gray brocket deer (*Subulo gouazoubira* Oliveira 2009; Nigro 2020; Guastalla et al. 2021; Aprile 2022; Muzzachiodi, 2023), marsh deer (*Blastocerus dichotomus* Pereira et al. 2023), red brocket deer (*Mazama americana* Mejía-Valenzuela & Auz-Cerón 2020; Ribeiro & Siqueira-Silva 2020; Guastalla et al. 2021), as well as lowland tapirs (*Tapirus terrestris* Alviz et al. 2005; Landis 2020; Tirira & Arbeláez 2020), collared (*Dicotyles tajacu* Veiga 1994; da Silva et al. 2019; Ruíz-Gutiérrez et al. 2023; Leão-Vulcão et al. 2024; Urgilés-Verdugo et al. 2024) and white-lipped peccaries (*Tayassu pecari* Aximoff et al. 2021).

Collared peccaries are pig-like ungulates with a large, triangular head, a stocky, compact body, and small legs (total length: 93.2-103 cm; weight: 12-28 kg). These tayassuids have grayish-brown fur with a thin pale-yellow line from the shoulders to the neck (Reid 2006; Aranda 2012; Reyna-Hurtado et al. 2014). The species' distribution ranges from the southern United States (Arizona, New Mexico, and Texas) to Argentina. Collared peccaries are highly gregarious, forming groups ranging from 2–15 individuals in tropical deciduous forests to as many as 50 in desert areas (Reyna-Hurtado et al. 2014). Specifically, only one case of piebaldism has been reported in collared peccaries throughout their distribution; that record comes from Brazil (Leão-Vulcão et al. 2024). For Mexico, there is only one previous record in the scientific literature of chromatic anomalies—leucism—for this species (Ruíz-Gutiérrez et al. 2023), as well as a record of a pair of albino specimens documented on a citizen science platform (https://mexico.inaturalist.org/observations/1122662). Here, we report the second record of a free-ranging *D. tajacu* with piebaldism in the entire range.

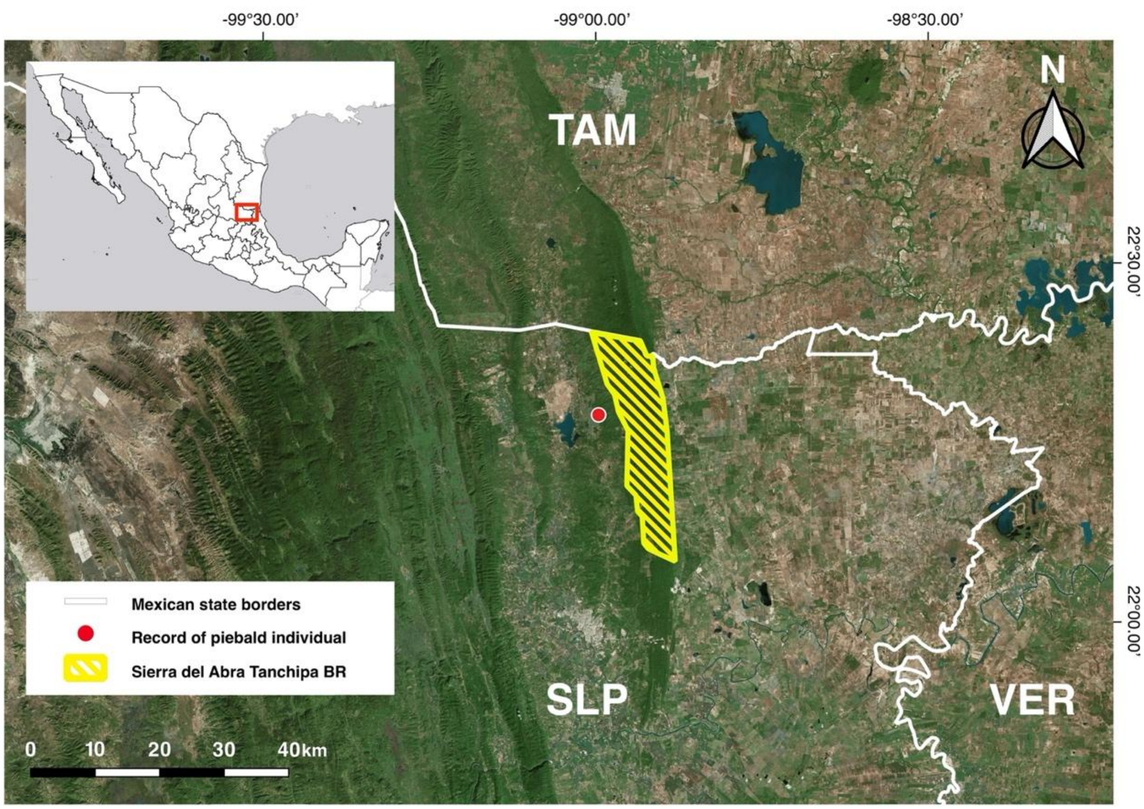


Figure 1. Location of the collared peccary (*Dicotyles tajacu*) individual with piebaldism (red dot) in the adjacent area of the Sierra del Abra-Tanchipa Biosphere Reserve (yellow striped polygon) in northeast San Luis Potosi, Mexico. Mexican states: TAM = Tamaulipas; SLP = San Luis Potosi; and VER = Veracruz.

The study site was the area adjacent to the Sierra del Abra-Tanchipa Biosphere Reserve (RBSAT), a natural protected area located in northeastern San Luis Potosi state (22,0833–

22.4061, -98,8794–99,0167), with elevations ranging from 120 to 820 m (CONANP 2014). This area is considered a Neotropical stronghold in northeastern Mexico (Figure 1). The region receives an average annual rainfall of 1.070 mm, with 81% falling during the wet season (June-October). The mean annual temperature is 25,7° C, although temperatures can rise to 51° C during the dry season (November-May; Durán-Fernández et al. 2020). The main vegetation includes low and medium sub-perennial rainforest, tropical deciduous forest, tropical oaks (*Quercus oleoides*), palm (*Sabal mexicana*) groves, and secondary vegetation (CONANP 2014; Durán-Fernández et al. 2020). The RBSAT is bordered by agricultural valleys featuring sugarcane (*Saccharum* spp.), citrus, and sorghum (*Sorghum* spp.) plantations, as well as cattle pastures and human settlements (Chapa-Vargas & Monzalvo-Santos 2012).

The record was obtained through the opportunistic use of camera traps (Browning Trail Cam®–Prometheus Group LLC) as part of a nature photography project that documented the wildlife species that inhabit the region. The cameras were placed in a dry stream within the tropical deciduous forest and near several sugarcane fields (22,2886, -98,9956; WGS84); in the vicinity of the RBSAT (Figure 1). They were positioned approximately 50 cm above the ground and configured to take videos of 30-second length every twenty minutes. The cameras remained active 24 hours a day between May and November of 2023. During this period, we obtained a total effort of 1.225 camera days with 28 videos of a female *D. tajacu* with white body parts, totaling 19 independent records (24-hour interval). They were made between August 24 and November 5 and included only videos of the piebald animal with the group, with periods of daytime (06hr00-18hr00) and nighttime (19hr00-05hr00) activity. Non-pigmented parts of the specimen included the forehead and left side of the face, the back to shoulder height including the flanks and part of the forelimbs, as well as part of the rump (Figure 2).

Our results consistently show that, despite not having the normal greyish-brown coloration pattern (Reid 2006; Aranda 2012; Reyna-Hurtado et al. 2014), the female exhibiting piebaldism interacted normally with conspecifics. This interaction included olfactory exploration, scent-based contact with other individuals, and even suckling her offspring. Similar behavior has been observed in other tayassuids with chromatic anomalies (da Silva et al. 2019; Aximoff et al. 2021; Leão-Vulcão et al. 2024). This is because social cohesion in these species relies on vocal and olfactory signals (Byers & Bekoff 1981; Kiltie & Terborgh 1981; Sowls 1997); therefore, individuals with different pigmentation would not be rejected from the herd (da Silva et al. 2019). Although they are considered to have a lower life expectancy (Sazima & Di-Bernardo 1991; Parsons & Bonderup-Nielsen 1995; Summers 2009), collared peccaries with chromatic anomalies that can reach adulthood have been registered (Veiga 1994; da Silva et al. 2019; Ruíz-Gutiérrez et al. 2023; Leão-Vulcão et al. 2024; Urgilés-Verdugo et al. 2024). Our record even documents that they can reproduce successfully.

Recently, chromatic anomalies have been frequently reported in mammal species, mainly those of medium or large size. However, little is known about the costs associated with these anomalies (Silva-Caballero et al. 2014), particularly hypopigmentation. Such anomalies are thought to provide indirect evidence of underlying genetic variability, as well as genetic changes related to fitness and population structure (Acevedo & Aguayo, 2008). Moreover, chromatic anomalies are frequently observed in gregarious or sedentary species and are thought to be more common in small, isolated populations (Bensch et al. 2000; Guevara et al. 2011). In recent decades, severe land-use change and habitat fragmentation have been documented in the RBSAT region (Painter et al. 2022), suggesting a possible influence on the occurrence of this type of chromatic anomaly due to factors such as inbreeding (Bensch et al. 2000; Silva-Caballero et al. 2014), combined with the hunting pressure suffered by the species (Méndez et al. 2025).

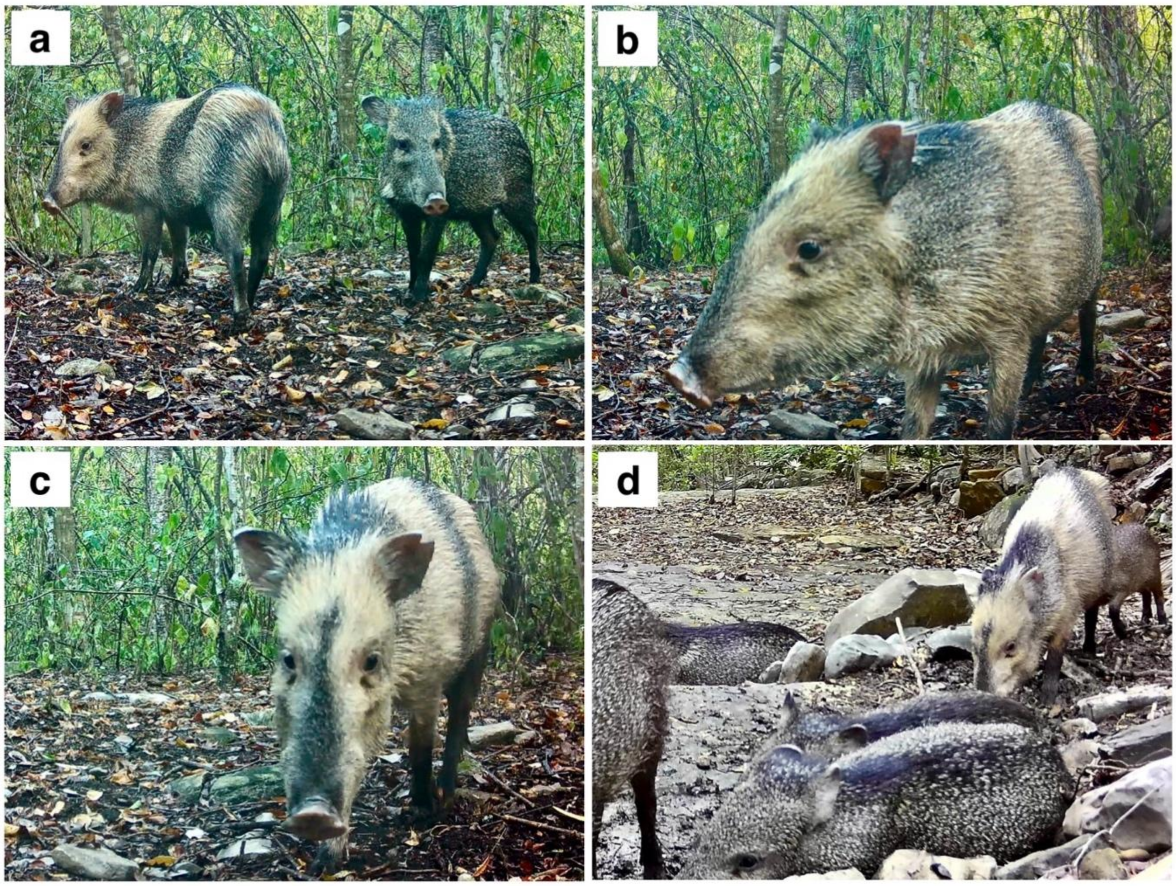


FIGURE 2. Female collared peccary (*Dicotyles tajacu*) with piebaldism: a) piebald individual (left) next to another individual with normal coloration, note the difference in fur coloration; b) and c) the non-pigmented parts of the specimen can be seen, including forehead and left side of the face, the back to shoulder height including the flanks and part of the forelimbs, as well as part of the rump; d) individual nursing its young.

Another possible explanation for the record presented here is that despite the low frequency of chromatic anomalies in free-ranging populations (Silva et al. 2020), they have been more commonly recorded in recent times due to greater access by more people to camera trapping tools (Palencia et al. 2022), which has allowed the recording of these variations in fur coloration, predation events, and behaviors never before recorded in wildlife populations. Therefore, we highlight the importance of camera traps as valuable tools for documenting the natural history of wildlife populations. These types of records should continue to be published to better understand this phenomenon, its distribution, and its potential ecological, physiological, and genetic implications.

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