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Observations of leucistic Turkey Vultures (*Cathartes aura*) in Jamaica

John M. Zeiger[1,2], Justin Proctor[3], and Seth E. Inman[1,4]

Abstract While censusing for the Golden Swallow (*Tachycineta euchrysea*) in the Cockpit Country and Blue Mountain regions of Jamaica, we observed six unique leucistic Turkey Vultures (*Cathartes aura*) across 634 standardized point counts. Leucistic individuals accounted for 0.2% of the total 2,826 Turkey Vultures we documented from 16 January to 12 February (28 days) and from 4 to 27 March (24 days) 2015. Though not a complete island-wide census, our observations offer the first documented insight on the prevalence and distribution of leucism in Jamaican Turkey Vulture populations.

Keywords *Cathartes aura*, Jamaica, leucism, Turkey Vulture

Resumen Observaciones de individuos leucísticos de *Cathartes aura* en Jamaica—Durante un censo de *Tachycineta euchrysea* en las regiones de Cockpit Country y Blue Mountains de Jamaica, observamos seis singulares individuos leucísticos de *Cathartes aura* a lo largo de 634 puntos de conteo estandarizados. Los individuos leucísticos constituyen el 0,2% del total de 2.826 *Cathartes aura* que documentamos desde el 16 enero hasta el 12 febrero (28 días), y desde el 4 hasta el 27 marzo (24 días) de 2015. Aunque no realizamos un censo completo de toda la isla, nuestras observaciones representan la primera documentación acerca de la prevalencia y distribución de leucismo en poblaciones de *Cathartes aura* en Jamaica.

Palabras clave *Cathartes aura*, Jamaica, leucismo

Résumé Observations d'Urubus à tête rouge (*Cathartes aura*) leucistiques en Jamaïque—Lors du recensement des Hirondelles dorées (*Tachycineta euchrysea*) dans les régions de Cockpit Country et de Blue Mountains en Jamaïque, nous avons observé six Urubus à tête rouge (*Cathartes aura*) leucistiques sur les 634 points de comptage normalisé. Les individus leucistiques représentaient 0,2% des 2.826 Urubus à tête rouge observés du 16 janvier au 12 février (28 jours) et du 4 au 27 mars (24 jours) en 2015. Bien qu'il ne s'agisse pas d'un recensement complet de l'île, nos observations sont les premières à documenter la prévalence et la répartition du leucisme dans les populations d'Urubu à tête rouge en Jamaïque.

Mots clés *Cathartes aura*, Jamaïque, leucisme, Urubu à tête rouge

Pigment aberrations such as leucism and albinism are rare but widely documented occurrences in the avian world (Jehl 1985, Forrest and Naveen 2000, van Grouw 2006). Both are disorders that result in the depigmentation of a bird's plumage, subsequently altering feather coloration. Carotenoids and melanines are the two main pigments that influence plumage coloration in birds. Carotenoids determine yellow to red coloration, and are regulated by a bird's diet; melanines confer brown, gray, black, and reddish brown colors, and are regulated by the enzyme tyrosinase (van Grouw 2006). In the case of albino birds (an extreme case of depigmentation), tyrosinase is completely absent, therefore causing the plumage and soft parts of these birds to lack all melanin-related pigments (although carotenoid pigments may still be present; Fox and Vevers 1960, van Grouw 2006). For that reason, albino birds usually display fully white plumage (although some yellow to red coloration is possible) and red eyes—as their blood vessels are visible through colorless optical tissues (van Grouw 2006). In leucistic birds, the tyrosinase enzyme is still present and thus melanin-related coloration is possible; however, the disorder prevents melanin from being deposited in some or all feathers. Leucistic birds always have normal-colored eyes, and their plumage can vary from fully white to a few scattered white feathers (van Grouw 2006).

While albinism has been shown to largely be a recessive genetic trait, evidence suggests that the genes responsible for leucism may be dominant (Sage 1962) or codominant (Edelaar *et al.* 2011). Although leucism is, by definition, a heritable genetic trait, there is evidence that similar partial depigmentation of a bird's plumage can be influenced by biological factors. For example, in one specimen of a Great-tailed Grackle (*Quiscalus mexicanus*) a large cyst was uncovered directly beneath depigmented plumage, and likely was the cause of the pigment aberration (Phillips 1954). A largely white Nihoa Millerbird (*Acrocephalus familiaris kingi*) was observed in August 1981, yet this individual displayed

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typical coloration when it was originally banded in June 1980. The same bird, viewed again in April 1983, was observed with just a few scattered white feathers (Conant 1984). A similar loss of plumage pigment was also documented in an American Robin (*Turdus migratorius*; Frazier 1952). In three species of *Acrocephalus* reed warblers known to remote Pacific islands, it has been hypothesized that the extent of their depigmentation increased with age (Graves 1992). Increased depigmentation of plumage over time has been referred to as progressive graying, and it has additionally been documented in Eurasian Blackbirds (*Turdus merula*), Eurasian Jackdaws (*Corvus monedula*), and House Sparrows (*Passer domesticus*) (van Grouw 2015).

Leucism occurs with varying degrees of rarity within the avian class. Among Chinstrap Penguins (*Pygoscelis antarcticus*), about 1 in 146,000 individuals displays leucistic coloration (Forrest and Naveen 2000). At Mono Lake in California, the frequency of leucism in migrant Eared Grebes (*Podiceps nigricollis*) varied from 1 in 460 to 1 in 75,000 across seasons (Jehl 1985). Leucism has been most notably documented in the families Anatidae (Wilson *et al.* 2006), Charadriidae (Cestari and Vernaschi Vieira da Costa 2007), Diomedeidae (Mancini *et al.* 2010), Procellariidae (Mancini *et al.* 2010), Accipitridae (Tinajero and Rodríguez-Estrella 2010), Tytonidae (Chiale and Pagano 2014), Strigidae (Nogueira and Alves 2011), Tyrannidae (Zilio 2013), Corvidae (Slagsvold *et al.* 1988), and Turdidae (Frazier 1952).

Due to genetic drift, leucism may become established more frequently in isolated populations of birds, such as those on islands (Sage 1962). In the Barnacle Goose (*Branta leucopsis*) population in Svalbard (archipelago ~650 km north of Norway), a relatively high occurrence of leucism, when compared to the mainland, may be the result of a few leucistic genes being present in the population's founding members (Owen and Skimmings 1992). Likewise, among White-winged Wood Ducks (*Asarcornis scutulata*) a much higher frequency of leucism is observed in the Sumatran versus the mainland population in Southeast Asia (Mackenzie 1990). On the small isolated Pacific islands of Rimitara, Pitcairn, and Henderson, endemic *Acrocephalus* reed warblers (*A. rimitarae*, *A. vaughani*, and *A. taiti*) display leucistic plumage at relatively high frequencies, and each island population has a notably different pattern of leucism (Graves 1992).

Leucism has been documented in different populations of Turkey Vultures (*Cathartes aura*) and closely related species. Among the New World Vultures (Cathartidae), leucism has been recorded in Turkey Vultures in Jamaica, California, Mexico, Peru, and Cuba (Gosse 1847, GGRO 2004, Tinajero and Rodríguez-Estrella 2010, Figueroa *et al.* 2011, Ferrer-Sánchez and Rodríguez-Estrella 2014), in Black Vultures (*Coragyps atratus*) in Ecuador (Hosner and Lebbin 2006), and in Andean Condors (*Vultur gryphus*) in Bolivia and possibly Chile (Pavez 2008, Méndez Mojica 2013). In Cuba, raptor researchers noted two leucistic Turkey Vultures among the approximately 9,200 vultures they observed during 2 yr of fieldwork, representing only 0.02% of the total number of vultures recorded (Ferrer-Sánchez and Rodríguez-Estrella 2014).

Turkey Vultures are a common and widespread resident and migrant of the Western Hemisphere. They breed from southern Canada to Tierra del Fuego, Argentina. The North American population winters from southern California to southern Texas in the west, and in the east as far north as Indiana and Connecticut. Some North American vultures winter in the Caribbean (Kirk and Mossman 1998). Turkey Vultures are currently expanding their range throughout the Caribbean, most notably in Hispaniola and Puerto Rico (Williams and Bunkley-Williams 1995, Curti *et al.* 2014).

Leucism in Turkey Vulture populations on the island of Jamaica, however, has been comparatively high for at least the last 150 yr (Gosse 1847, Jeffrey-Smith 1949, 1956). There is currently a large resident breeding population on the island (Downer and Sutton 1990), likely of the subspecies *C. a. aura* (Wetmore 1964).

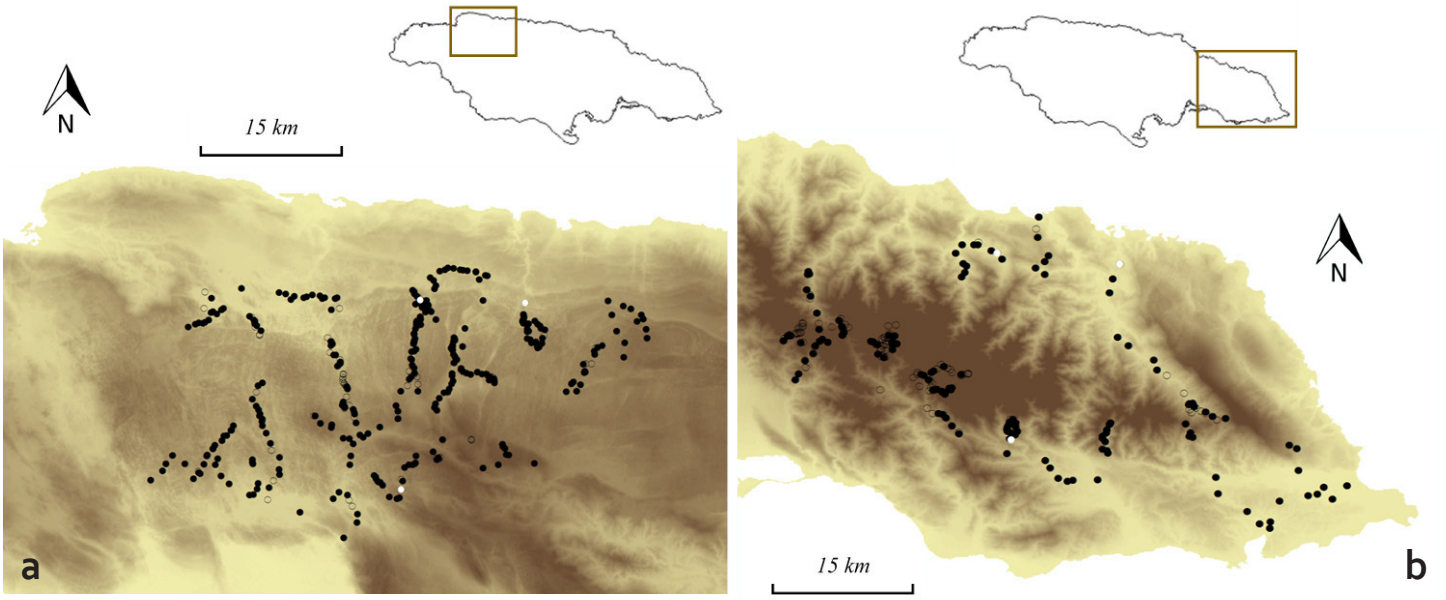

Fig. 1. Maps depicting point counts conducted in (a) the Cockpit Country, Jamaica, and (b) the Blue Mountains, Jamaica. Dots indicate no vultures observed (empty black dots), vultures observed (solid black dots), or leucistic vultures observed (filled white dots). Map shading depicts topography, with colors darkening as elevation increases.

Table 1. Times and locations of leucistic Turkey Vulture observations.

Individual	Date and Time	Location	Geographic Coordinates	Elevation (masl)
1	25 January 2015; 0830 10 February 2015; 1545	Cockpit Country; Kinloss area	18°23'16.8"N, 77°33'04.3"W	564
2	6 February 2015; 1004	Cockpit Country; Stewart Town	18°23'06.7"N, 77°26'45.6"W	255
3	9 February 2015; 1211	Cockpit Country; Whitby	18°11'39.5"N, 77°34'13.8"W	576
4	6 March 2015; 1706	Blue Mountains; Somerset	17°58'59.9"N, 76°32'27.2"W	289
5	14 March 2015; 1525	Blue Mountains; Fellowship	18°09'08.3"N, 76°26'42.7"W	70
6	18 March 2015; 0939	Blue Mountains; Fruitful Vale	18°09'45.7"N, 76°33'12.2"W	83

Here we examine the prevalence of leucism in the Jamaican populations of Turkey Vultures.

Methods

From 16 January to 12 February (28 days), and from 4 to 27 March (24 days) 2015, we performed extensive surveys in search of the critically endangered Jamaican Golden Swallow (*Tachycineta euchrysea euchrysea*) in both the Cockpit Country and Blue Mountain regions of Jamaica, Greater Antilles (Proctor *et al.* 2017). We selected specific point count sites based on the maximum available field of view as well as directionality (some point counts were spatially close in proximity to each other but offered different views of the surrounding landscape due to the local topography). Total available field of view was dependent on both the structure of the landscape as well as canopy cover. Point counts lasted for a minimum duration of 5 min, extending longer if avian species in the aerial insectivore guild were present. Because the primary search target occupied roughly the same spatial niche as Turkey Vultures, we recorded the number of individual vultures seen as well as the presence or absence of leucism. Extended observations of leucistic Turkey Vultures and their behaviors were conducted when a leucistic individual was positively identified. We used a Garmin Oregon® 650 handheld GPS (Garmin Ltd., Olathe, KS, USA) to record point count locations.

When a leucistic vulture was identified in the field, we recorded the sighting and took photographs. By later examining the digital images to determine the degree and locations of leucism in the bird's plumage, we were able to accurately describe the pattern of leucism in the plumage of six out of the seven birds photographed. As all the observations were conducted within a 75-day block of time, during months in which Turkey Vultures were only likely to molt primaries p2 to p5 and secondary s1 (Chandler *et al.* 2010), leucistic vultures exhibiting different patterns of plumage coloration were considered to be unique individuals. If a vulture that was observed in the same location as a previous individual had indistinguishable plumage from the vulture previously observed, we assumed it was the same individual.

Results

Across 634 point counts in Jamaica (Fig. 1), we made 7 observations of leucistic Turkey Vultures (Table 1) out of the total 2,826 Turkey Vultures observed, equaling a 0.2% rate of leucism. Here we present the details of the 7 leucistic Turkey Vultures, involving 6 unique individuals. The leucistic vulture observed in Whitby was photographed at a distance that allowed us to confirm the presence of leucism, but not specific patterns of coloration.

Detailed Descriptions

Individual 1.—Individual was first observed on 25 January perching in a tree on the side of a Cockpit karst limestone rainforest hillside above agricultural fields at the northern end of Barbecue Bottom Road, near the town of Kinloss. This individual was almost completely white: about 80% of the wings and back appeared white, as did the feathers around the neck and on the underside, while some primaries, the tertials, and a scattering of feathers on the back were black.

This individual was likely observed again in the same location on 10 February soaring above the valley and later perched on a tree on the side of a karst limestone rainforest hillside above the agricultural fields north of the end of Barbecue Bottom Road. This vulture's outermost four primaries, p7 to p10, were dark; p3 to p6 were white; p2 was black; and p1 was white. The first secondary, s1, appeared to be black, and the rest of the secondaries were white. The tertials were all dark, and the scapulars appeared to be white. There seemed to be some white in the underwing coverts, and the flanks and neck were clearly white (Fig. 2). When perched, the feathers visible on the back were

Fig. 2. Leucistic Turkey Vulture soaring over the north end of Barbecue Bottom Road, Cockpit Country, Jamaica (individual 1). Photograph by Justin Proctor.

mostly white. The patterns of white in the primaries and tertials and the extensive white coloration of this individual matched that of the individual observed on 25 January, although we were able to observe the individual in better detail on the later date.

Individual 2.—Individual was perched at the top of a communications tower near Stewart Town. Five non-leucistic Turkey Vultures were present, four of which soared above the cell tower while the fifth perched opposite the leucistic individual. Both perched vultures were engaged in preening, and the leucistic individual was preening the primaries on its left wing. The feathers around its neck were predominantly white, and there were white feathers scattered throughout the wing. However, the vast majority of the visible feathers on the wing appeared dark.

Individual 3.—Individual was soaring below the crest of a Cockpit karst limestone hillside near the town of Whitby. The valley is largely comprised of houses, pastures, and agricultural fields. Five non-leucistic vultures were observed soaring in the nearby hills; one flew in close proximity to the leucistic individual. The leucistic individual appeared to be mostly white, although the degree of leucism was difficult to assess at such a great distance.

Individual 4.—Individual was preening its neck feathers while perched on a branch of *Cecropia peltata* overlooking a riverbank near the town of Somerset in the southern foothills of the Blue Mountains. We observed the same bird the next morning at 0715 in the same location, and believe it roosted there overnight. The underparts, rectrices, and neck feathers of the vulture were white. The greater upperwing coverts appeared to be mostly dark, and there was a scattering of other dark feathers on the wings and shoulders of this predominantly white bird (Fig. 3).

Individual 5.—Individual was soaring at the northern end of the Rio Grande Valley in the town of Fellowship. Two non-leucistic Turkey Vultures were observed soaring in the surrounding area. The plumage of this vulture was dark around the neck and on the upperwing coverts, although there were some scattered white feathers. Patches of approximately four white feathers were evident in both the primaries and secondaries, as were additional scattered white feathers in the secondaries (and possibly in the tertials). The alula on both wings was white. The rectrices appeared to be largely white, although the outermost feathers were dark. The back appeared to be about 50% white.

Individual 6.—Individual was soaring above the small town of Fruitful Vale north of the Blue Mountains. Five non-leucistic Turkey Vultures were observed flying in the surrounding area. The leucistic vulture was largely dark colored, but had a scattering of white feathers on its neck, back, and amongst the secondaries.

Turkey Vultures were highly abundant and widespread across Jamaica, while leucistic individuals were rare and widely scattered across our study area (Fig. 1). Leucistic Turkey Vultures were found from elevations of 70 m to 576 m and in varied habitat, including agricultural fields, riverine valleys, and forested mountains.

Fig. 3. Leucistic Turkey Vulture perched on a *Cecropia peltata* in Somerset, Jamaica, on a south-facing slope of the Blue Mountains (individual 4). Photograph by Justin Proctor.

Discussion

Leucism in Jamaican Turkey Vulture populations has been widely recognized and recorded since the mid-1800s, including birder accounts within the island's ornithological publication, the Gosse Bird Club Broadsheets, and specific mentions by Gosse (1847) and Jeffrey-Smith (1949, 1956), and its presence is common knowledge among rural Jamaicans (JMZ pers. obs.). Gosse (1847) documented leucism in the population for the first time during an 1846 survey of the island. Jeffrey-Smith (1949, 1956) recorded a pure white individual in Stewart Town as well as other leucistic individuals in 1922 and 1927. Between 1963 and 1995, reliable local birdwatchers have noted at least 13 occurrences of leucistic Turkey Vultures in Jamaica in the Gosse Bird Club Broadsheets (C. Levy in litt.). These observations cluster around coastlines and the major cities of Kingston and Montego Bay, which could be a reflection of these areas being more accessible to birders.

As leucism has not been noticeably observed in the migratory population of Turkey Vultures in North America, and due to the historical records and local familiarity with this trait in Jamaica, it is most probable that the leucistic individuals are Jamaican residents rather than migrants from the north (Gosse 1847, Jeffrey-Smith 1949). According to local knowledge (conversations with rural farmers), leucistic vultures will pair with non-leucistic individuals, and the progeny retain some degree of leucism. This would indicate codominance of the leucistic trait. In the field, we noted considerable variation in the degree to which leucism was expressed—some vultures were almost pure white, while others had just a scattering of white feathers. Studies have shown that in other birds leucistic plumage is often dominant or codominant (Sage 1962, Edelaar *et al.* 2011). Since dominant and codominant traits are exposed to higher degrees of natural selection (Hartl and Clark 1997), leucism would have been likely to disappear from the population if there were strong negative selective pressure. Leucism is generally thought to be evolutionarily disadvantageous for bird species because of differential predation (Slagsvold *et al.* 1988), but this may not be the case in Jamaican Turkey Vulture populations. For instance, Turkey Vultures have few natural predators and feed on carrion; they do not rely on camouflage for concealment (Kirk and Mossman 1998). According to local folklore, non-leucistic vultures will allow a leucistic

individual to feed first from a newly discovered animal carcass. One Jamaican Forest Service ranger explained that many people believe "The Parson John Crow blesses the food first; he is the leader." ("John Crow" is the local name for the Turkey Vulture, and the title "Parson" refers to the white coloration.) This folklore is supported by observations of aggressive leucistic Turkey Vultures expelling non-leucistic vultures from carcasses in Cuba and Baja California Sur, Mexico (Tinajero and Rodríguez-Estrella 2010, Ferrer-Sánchez and Rodríguez-Estrella 2014). If leucistic vultures do tend to be more assertive than their more pigmented counterparts, it could be hypothesized that they exhibit higher overall fitness.

Nevertheless, leucism may be a neutral trait, and genetic drift within the Jamaican populations may have allowed it to persist. High rates of leucism have been described in other isolated island avian populations (Mackenzie 1990, Graves 1992, Owen and Skimmings 1992). We did not observe any notable social behavior between leucistic and non-leucistic vultures, though we did observe them in close proximity to each other on multiple occasions. Researchers in Baja California Sur, Mexico, noted leucistic vultures soaring and perched in close proximity to non-leucistic individuals (Tinajero and Rodríguez-Estrella 2010). Throughout the Gosse Bird Club Broadsheets, Jamaican birdwatchers have also noted leucistic individuals perching, soaring, and feeding with non-leucistic vultures (C. Levy in litt.).

It seems likely, based on our widespread observations of leucistic Turkey Vultures in Jamaica, that they are not confined to any specific region of the island. Furthermore, the year-round sightings of leucistic individuals suggest that leucistic Turkey Vultures are part of the resident breeding population. More research into the inheritance of leucistic traits, social behavior and sexual selection of leucistic individuals, and vulture movement patterns is needed to understand the factors involved in the enduring prevalence of leucism among Jamaican Turkey Vultures.

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