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Partial albinism in Red-vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766) from Rajgir Wildlife Sanctuary, Nalanda, Bihar, India

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Abstract

The current study presents findings on the occurrence of partial albinism (leucism) in a bird species, Red-vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766) in the Rajgir Wildlife Sanctuary located in Nalanda district of Bihar, India. Various anomalies in color patterns result in conditions such as Albinism, Erythrism, Melanism, Xanthism, and Schizochromism. These conditions are characterized by alterations in pigmentation concentration and occurrence patterns in living organisms. Leucism is a biological condition characterized by the impairment of melanin production in cells. We recorded the individual a total of eight times along with a normal individual on most occasions around the same locality while continuing the surveys for the next 4 months.

Keywords: Albinism, Birds, polymorphism, Leucism, Rajgir Wildlife sanctuary, Red-vented Bulbul

Introduction

The concept of polymorphism has a rich and captivating historical background in the field of wildlife and biological science. In the past, this term is used for taxa which exhibits distinctly variable forms at different life stages e.g. difference in juvenile, sub-adult and adults and moreover sometimes during breeding stages. Polymorphism always represents variable forms among interbreeding individuals in a population. However, when observed among different geographical populations, such differences are termed as 'polytypic' and they can further be termed as races or subspecies. Thus, polymorphism always refers to the presence of two or more morphs or varieties in one location. Darwin used polymorphism for species that exhibited 'an inordinate amount of variation'.

Typically, one of the variants can be described as having an 'excess' of a particular color pigment among individuals in any population. The rest of the individuals are then considered to be as normal. In birds it is observed that the amount and occurrence of pigmentation is unusual in contrary to normal patterns and it can be classified into four major types as: Albinism (exhibiting pure white plumage or the wild-phase coloring pattern with extreme paleness), Erythrism (exhibiting an abundance of reddish coloring or pigmentation), Melanism (exhibiting an excess or high abundance of black or brown pigmentation), and Xanthism (excess of yellow pigmentation and such individuals are generally described as blonde) (Sharma *et al.*, 2018) [31]. In addition to these additionally, Schizochromism is a condition where unusual, atypical color patches (usually white) are observed in the plumage.

Albinism is characterized by reduced coloration due to loss of melanin pigment production in the integumentary cells of several organisms, including the skin, feathers, scales, hairs and eyes (Hiler, 1983; Kinner *et al.*, 1985; Oetting and King, 1999) [14, 18, 24]. The occurrence of albinism in animals is widely observed and investigated through scientific inquiry since the era of Carolus Linnaeus in the mid-1700s. Although albinism is a very uncommon occurrence, it has been documented in several species, including both invertebrates and vertebrates, across many regions worldwide (Ortenburger, 1922; Sage, 1962; Gross, 1965; Jehl, 1985; Mitchell and Mazur, 1998; Veena *et al.*, 2011; McCardle, 2012; Fernández-Rivera *et al.*, 2015; Gabadage *et al.*, 2015) [25, 29, 12, 16, 22, 34, 20, 7, 9]. The condition of albinism exhibits a range of severity, spanning from extreme to more varied appearances. A) Complete or true albinism is defined as the entire absence of integumentary and retinal pigmentation (Sandoval-Castillo *et*

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al., 2006)^[30] in skin, hair, and eye (oculocutaneous albinism), or mainly in the eye (ocular albinism), which is due to mutations resulting in an imbalance in melanin pigment production. In cases of complete or total albinism, not only the plumage but also the bill/beak and legs are white, and the eyes develop pink or red. B) Partial albinism occurs when pigmentation in the skin, feathers, or eyes is reduced or completely absent (Berdeen and Otis, 2011)^[4] but pigmentation in retinas, with reduced or no body coloration and darkly pigmented eyes. Partial albinism is further classified as incomplete, imperfect and partial albinism (Jehl, 1985)^[16]. (i) In cases of incomplete albinism, the absence of pigmentation is observed in the eyes, integuments, or plumage, but not in all of these areas simultaneously. (ii) Imperfect albinism refers to a physiological condition characterized by a partial inhibition of melanin formation, leading to the manifestation of a pale phenotype in the affected organism. (iii) However, partial albinism is the most prevalent form, where localized body parts are white and patchy condition are also observed. The majority of unusual cases of white birds observed in nature fall into this category. Leucism, also known as leukism, is a type of partial albinism defined by the retention of color in the eyes, bill, and legs but no pigmentation in the skin or plumage (Forrest and Naveen, 2000)^[8].

Albinism is a recessive genetic trait that is relatively uncommon. It is a hereditary condition that inhibits the development of the tyrosinase enzyme, which is responsible for melanin synthesis. Several genes affect the pigmentation of the skin, hair, and eyes, with different alleles controlling the amount and concentration of melanin pigmentation. Although albinos are rare, but gene transmission continues from generation to generation and albinos continue to be encountered in the wild (Summers, 2009)^[33]. The absence or reduction in pigmentation during the growth of feathers can

be attributed to various factors, including gland blockage, shock, disease, injury, an uneven diet or exposure to ultraviolet radiation.

Albino animals are uncommon because the albino allele sequence is recessive. Leucism, on the other hand, is governed by a single recessive allele (Owen and Shimmings, 1992)^[26]. Albinism has been linked to a variety of reasons other than hereditary impact. According to Sage (1962)^[29], albinism can also be caused by food, senility, shock, disease, or injury; complete or partial albinism may be present at birth, arise later in life, or decline as an individual develops through life. According to Acevedo *et al.* (2009)^[1], another cause of albinism is a genetic inherited disorder involving metabolism during embryonic development or abnormalities in melanocyte production and function that alter the spatial distribution or density of pigmentation over the body or along individual hairs.

In this paper, we report a case of partial albinism or leucism in Red-vented Bulbul *Pycnonotus cafer* from Rajgir Wildlife Sanctuary (WLS) in the Nalanda district of Bihar, India.

Material and Methods

Study Area

Rajgir WLS is a protected area situated between 24° 55' and 25° 05' N latitude and 85° 06' and 85° 30' E longitude in the south of the Nalanda district in Bihar. Administratively, it falls in Nalanda Forest Division encompassing an area of 35.84 km² (Fig. 1). The Rajgir WLS is encompassed by five peaks of the Rajgir hills (Baibhavgiri, Ratnagiri, Sonagiri, Udaigiri and Vipulgiri) and that constitute a natural topographic boundary dividing the sanctuary from the surrounding landscape of agricultural fields, roads, settlements and villages. The Rajgir WLS also shares border with the Gaya and Nawada district.

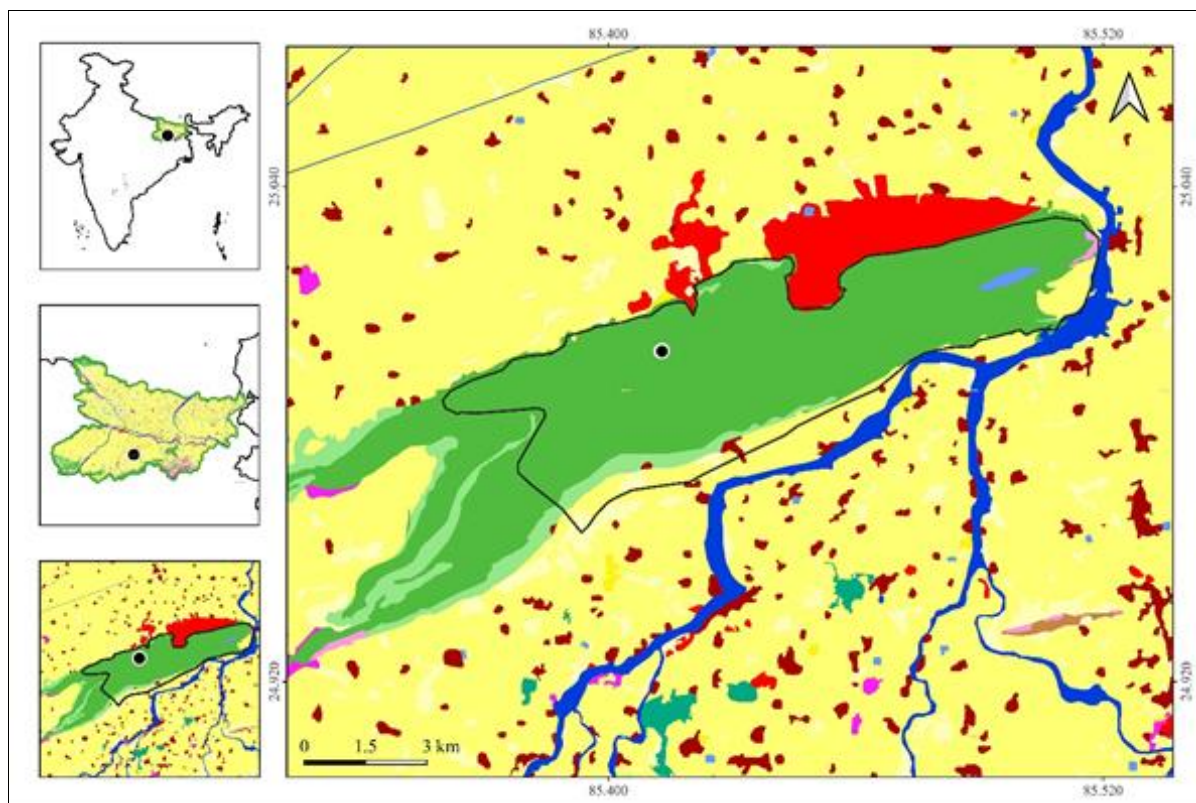


Fig 1: Map of Rajgir WLS showing sighting locations of leucistic Red-vented Bulbul

The Pachanan and Saraswati rivers, as well as the town of Rajgir, are located to the north of the sanctuary. Forest types in Rajgir WLS consist of Dry Peninsular Sal Forest, Dry Deciduous Scrub Forests, Boswellia forest, Northern Dry Mixed Deciduous Forests, Cane breaks and plantations.

Bird Sampling

Field sampling were conducted during February-August 2023 in Rajgir WLS. Information was also collected on behavior, habitat use and activity pattern of the bird species.

All photographs were taken using Nikon Coolpix P900 camera and GPS locations were recorded using Garmin etrex® 10 GPS. The map was created using the Free and Open Source QGIS (ver. 3.32.1-Lima) software.

Results and Discussion

We recorded a partial leucistic individual of Red-vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766) from Rajgir WLS in Nalanda district of Bihar in India. In total, the leucistic individual was sighted on 8 occasions (Table 1) (Fig. 2) in and around few hundred meters of the first location (Fig. 1). It was first reported on 16 April 2023 and lastly on 09 August 2023. Interestingly, the individual is recorded with another normal individual at 8 occasions out of total 8 sighting incidents. The pair was also observed on two occasions in the presence of another typical bulbul flock, at an approximate distance of 10-15 meters during its breeding season.

Table 1: Sighting locations with GPS coordinates, altitude and dates on which leucistic Red-vented Bulbul was observed Rajgir WLS

S. No.	Latitude	Longitude	Altitude (m)	Date of sighting
1	25.00003	85.41300	102	16 April 2023
2	25.00003	85.41292	100	18 April 2023
3	25.00010	85.41267	96	07 July 2023
4	25.00017	85.41283	105	08 July 2023
5	25.00020	85.41295	106	10 July 2023
6	25.00022	85.41293	106	16 July 2023
7	25.00032	85.41307	106	30 July 2023
8	25.00015	85.41288	104	09 August 2023

Red-vented Bulbul *Pycnonotus cafer* belongs to family Passerines and commonly called bulbuls. It is a native resident breeder to South and Southeast Asia, including Tibet. It is an omnivorous bird and feeds mainly on insects, fruits, and flower buds. This bird is easy to spot and frequently observed with a lot of other birds. It is often seen high up in trees or perched on wires in both urban and rural areas. It usually chooses a habitat with scrubby edge, grassland and open areas instead of a dense forest (Rasmussen and Anderton, 2005) [28]. A range of chirps and whistles are identified as calls. It is a medium-sized, dark bird with a black crest and a white rump with red color under the tail (Grimmet *et al.*, 2016) [11].

We recorded this leucistic individual around a little moist bamboo patch in dry scrub forest with morphological features showing normal pigmentation on crown, nape, ear-coverts, chin and throat including covert, allula, primaries, secondaries and tertiaries on wings. However, the scapula, breast, flanks, belly, vent, undertail coverts and back region was completely white (Fig. 2). Some melanistic feather streaks were observed diffusely radiating from throat to breast (Fig. 2) and a single central top tail feather was also white. The individual was observed to exhibit normal behaviour as other Red-vented Bulbul individuals around in the vicinity. The white region was also prominent on vent and red vent was only visible

while observing from front. It always appeared to be very shy of human presence.

Albinos may exhibit a diminished likelihood of survival in their natural habitat. Albino animals are observed responding positively and negatively to their albinistic characteristics (McCardle, 2012) [20]. The lack of melanin leads to the compromised growth of the iris, retina, eye muscles and optic nerves. Consequently, individuals with albinism are prone to experiencing visual impairments, including difficulty in focusing sharply, heightened sensitivity to light, and reduced perception of depth (Heiduschka and Schraermeyer, 2007) [13]. The lack of pigmentation in their skin, resulting in a white or pale, hinders their ability to camouflage with their surroundings, rendering them easily noticeable to potential predators (Sandoval-Castillo *et al.*, 2006; Acevedo *et al.*, 2009) [30, 1].



Fig 2: Photographs of leucistic Red-vented Bulbul individual captured in Rajgir WLS

Melanin imbalance in albinistic individuals is reported to affect, mimicry, camouflage, sexual display, vision and innate immunity (Sugumaran, 2002; Protas, 2008) [32, 27]. Albinos, due to their lack of vividly coloured and diverse-patterned plumage, are unable to invoke attraction from potential mates or conspecifics. Consequently, they face challenges in forming social or kin groupings (Binkley, 2001) [6]. Thus, these individuals are likely to face reduced fitness and social success in the wild. As we always observed this leucistic individuals in close association with a normal individual, close to other birds of same species and we report the behavior as normal. McCardle (2012) [20] reports that such

individuals may be prime target for prey but despite to their lack of natural pigmentation, they appear to do fairly well.

Extreme cases of skin pigmentation variations have previously been documented in Red-vented Bulbul. Interestingly, Law (1921) ^[19] documented a case of a totally melanistic individual from India with a complete deep black coat and without white or pale colouring in the individual. Later Berry (1894) ^[5], Baker (1915) ^[2] and Joshua (1996) ^[17] observed various kinds of partial albinism and leucism in bulbuls from various sites in India. Ghose and Khan (2005) ^[10] observed an albino bulbul at Keibul Lamjao National Park, Manipur, India. Mestri *et al.* (2011) ^[21] reported incomplete albinism in Red-vented Bulbul individual from Raigad, Maharashtra. Gadabage *et al.* (2015) ^[9] documented a case of total albinism in Red-vented Bulbul from Gampaha town in Sri Lanka. Mohan *et al.* (2017) ^[23] and Sharma *et al.* (2018) ^[31] recently reported cases of partial albinism in Red-vented Bulbul from Bejjur Reserve Forest in Telangana and Ajmer in Rajasthan, respectively.

Previous workers attributed albinism to many environmental parameters like, low quality habitat and diet. However, Holyoak (1978) ^[15] and Bensch *et al.* (2000) ^[3] indicated partial albinism in small and isolated populations and it is to be expected given the increased likelihood of inbreeding.

Bensch *et al.* (2000) ^[3] described an intriguing case of recovery from a genetic bottleneck in a semi-isolated population of great reed warblers (*Acrocephalus arundinaceus*) in Sweden, where partial albinistic warblers were substantially more common. Monitoring partial albinism in large-scale geographic studies has the potential to help in identifying groups vulnerable to environmental stress or inbreeding. Rajgir WLS is a very small island forest patch of 35.84 km² (Fig. 1: inset picture of green forest cover in Bihar) surrounded by a very huge degraded agricultural landscape with almost no tree cover at all on all side. It is not linked to any protected area or natural forest, indicating a significant threat of inbreeding in the wildlife population, which require continuous monitoring of wildlife status and their health in order to conserve biodiversity in this island natural forest and very small protected area and especially for habitat specialists.

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