

Observation of Albinistic and Leucistic Black Mangabeys (*Lophocebus aterrimus*) within the Lomako-Yokokala Faunal Reserve, Democratic Republic of Congo

Timothy M. Eppley, Jena R. Hickey & Nathan P. Nibbelink

Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia, USA

Abstract: Despite the fact that the black mangabey, *Lophocebus aterrimus*, is a large-bodied primate widespread throughout the southern portion of the Congo basin, remarkably little is known in regards to the occurrence rate of pelage color aberrations and their impact on survival rates. While conducting primate surveys within the newly protected Lomako-Yokokala Faunal Reserve in the central Equateur Province of the Democratic Republic of Congo, we opportunistically observed one albinistic and two leucistic *L. aterrimus* among black colored conspecifics and affiliative polyspecifics. No individual was entirely white in color morphology; rather, one was cream colored whereas two others retained some black hair patches on sections of their bodies. Although these phenomena may appear anomalous, they have been shown to occur with some frequency within museum specimens and were documented once in a community in the wild. We discuss the potential negative effects of this color deficiency on the survival of individuals displaying this physically distinctive pelage morphology.

Key words: black mangabey, albinism, leucism, Congo, Lomako, *Lophocebus*

Résumé: Malgré le fait que le mangabey noir, *Lophocebus aterrimus*, est un primate d'une grande taille qui est répandu dans toute la partie sud du bassin du Congo, remarquablement peu est connu quant au taux d'occurrence des aberrations de la couleur du pelage et leurs impacts sur les taux de survie. Pendant que menant les inventaires de primates dans la Réserve de Faune de Lomako Yokokala qui était récemment protégée dans la province centrale d'Equateur de la République Démocratique du Congo, on a observé opportunistiquement quelques *L. aterrimus*, une avec albinisme et deux avec leucisme, parmi des conspécifiques noirs et des polyspécifiques affiliatifs. Aucun individu n'était entièrement blanc dans la morphologie de couleur; plutôt, on était crème tandis que deux autres ont maintenu des taches noires sur des sections de leurs corps. Bien que ces phénomènes puissent sembler anormaux, on en a montré pour se produire avec une certaine fréquence dans des spécimens de musée et ils ont été documentés une fois dans une communauté dans la nature. On discute les effets négatifs potentiels de cette insuffisance de couleur sur la survie des individus qui montrent cette morphologie notable de pelage.

INTRODUCTION AND BACKGROUND

The Democratic Republic of Congo (DRC) is well known for its exceptional level of faunal and floral diversity. In fact, a total of 31 primate species are known to occur there, representing 17 genera within three families; seven (23%) of these species are endemic (Oates, 1996). Unfortunately, there has been limited field research on a majority of these species. One such primate, the black mangabey, *Lophocebus aterrimus*, ranges throughout the southern portion of the Congo basin, existing south and west of the Congo and Lualaba Rivers, respectively (Groves,

1978, 2001; Horn, 1987a, 1987b). The IUCN Red List currently lists *L. aterrimus* as Near Threatened (Hart *et al.*, 2008), yet the paucity of research on this species suggests that much remains unknown about this locally common mangabey species. The typical pelage of this relatively large-bodied, arboreal primate is black all over, with the exception of long grayish hair in the whisker and cheek area. No additional color morphs have yet been described in the existing literature on *Lophocebus* other than a brief mention of pelage color aberrations (Groves, 1978, 2001, 2007; Grubb *et al.*, 2003; Horn, 1987a) that corroborate our observations.

Black mangabeys are rarely seen alone, often opting to forage and travel within polyspecific groups. This behavior includes a combination of affiliations with species including red-tailed guenon *Cercopithecus ascanius* ssp., Wolf's guenon *C. wolfi*, Angolan pied colobus *Colobus angolensis*, Tshuapa red colobus *Piliocolobus tholloni* (Horn, 1987a); DeBrazza's guenon *C. neglectus*, and Allen's swamp monkey *Allenopithecus nigroviridis* (Eppley, 2007, pers. obs.). *Lophocebus* spend the majority of time in the mid- to upper-canopy within continuous evergreen forest (Horn, 1987a; Olupot *et al.*, 1997), but also have been known to inhabit isolated forest patches (Chalmers, 1968).

The observations presented here were made during a six-month survey in the newly protected Lomako-Yokokala Faunal Reserve (Figure 1) in central Equateur Province, DRC. The reserve, gazetted in 2006 (Henson *et al.*, 2009), comprises 3,625 km² of continuous rain forest north of the Lomako River and south of the Yokokala River and is demarcated further by small tributaries to both the east and west of the forest block (Henson *et al.*, 2009; Omasombo *et al.*, 2005). We opportunistically sighted two different phenotypes of white-color morph *L. aterrimus* while walking freshly cut transects after formal surveys had been completed within the southeast quadrant of the reserve. The methods used to collect observational data are in compliance with the requirements and guidelines of the Congolese Institute for the Conservation of Nature (Institut Congolaise pour la Conservation de la Nature, or ICCN) and adhered to the legal requirements of the DRC.

Whereas we cannot rule out the possibility that a hitherto undocumented buff phenotype may occur at low rates in this species, we offer the possibility that two congenital disorders of pigmentation, leucism and albinism

– both of which may result in either complete or patchy white hair (Jehl, 1985; Krecsák, 2008) – could explain the observed pelage color. Leucism is the absence of recognizable melanocytes, which affect all types of pigmentation, and results in reduced or absent integumentary pigmentation, yet individuals retain normal eye color. Conversely, albinism reduces only melanin. This condition therefore can be associated with eye color ranging from very light blue to brown, with the possible appearance of red due to the lack of melanin production in the irises of affected individuals (MayoClinic, 2010). We believe we observed both albinism and leucism in mangabeys.

SIGHTINGS

Our first sighting of a white-morph black mangabey occurred on April 7, 2009, when a cream-colored *L. aterrimus* was observed within a polyspecific group comprised of normally-colored conspecifics, red-tailed guenons *Cercopithecus ascanius whitesidei* and Wolf's guenons *C. wolfi wolfi*. This population is not habituated to the presence of human observers and all individuals quickly fled soon after our sighting. Despite the area's designation as a protected faunal reserve, we witnessed abundant evidence of regular human hunting pressure, as did Omasombo *et al.* (2005), likely explaining the animals' rapid flight. The suspected albino individual displayed an entirely cream-colored pelage; unfortunately, the retinal pigmentation of this individual could not be confirmed. We therefore based our conclusion of albinism on two traits: the absence of any retained black hairs, and the creamy, rather than pure white coloration. Patches of black hairs on a primarily white pelage would be more indicative of leucism (Jehl, 1985) and cream or blonde fur is common in albinism (Hu *et al.*, 1980).

Our second observation, on April 22, 2009, was of two suspected leucistic black mangabeys and was similar to the first in that they were sighted in a polyspecific context. These individuals (see Figure 2) exhibited normal pigmented eye color and retained small patches of black hair that occurred on a combination of their crown (including crest), outer surface of arms, shanks, and very lightly across the mid-back and base of tail. The remainder of their pelage was pure white, thereby facilitating the detection of the individuals. Locals are so familiar with this phenotype that they have named it “*iyema*,” referring specifically to the white-color morph of “*ngila*,” the Lingala word for black mangabey.

DISCUSSION

The occurrence of uncharacteristically white pelage among black mangabeys appears to be rather frequent. Groves (1978) described studying 7 (6.3%) skins from a total 112 that exhibited white patches of hair throughout their typical black pelage. All seven specimens appeared to be

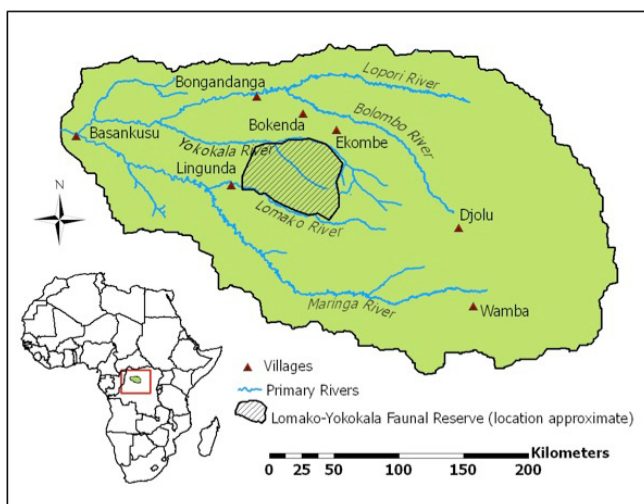


Figure 1. Albinistic and leucistic black mangabeys were observed inside the Lomako-Yokokala Faunal Reserve (21°05'E, 00°50'N) within the Maringa-Lopori-Wamba landscape, central Equateur Province, Democratic Republic of Congo.



Figure 2. Leucistic black mangabey, *Lophocebus aterrimus*, in the Lomako-Yokokala Faunal Reserve, DRC. The individual is only partially white, with black hair retained along the crown (including crest), outer surface of arms, and very lightly across the mid-back. Photograph by T. M. Eppley.

distinct in their patterning of white hairs, and none was fully albinistic. This occurrence rate may be inflated, as pelage color disparities likely altered the collection rate of white-morph individuals. Prior to the 20th century, naturalists and specimen collectors assumed pelage morphological distinctions to be significant in their assessment of divergent species, leading to increased collection rates of atypical specimens that are now recognized as conspecifics (Groves, 1978, 2007; Horn, 1987b). A similar rate of occurrence was observed in the wild, however, near Lake Tumba, DRC, where 4 (5.8%) individuals from a population of 69 black mangabeys were described as exhibiting some degree of white color morphology throughout their pelage (Horn, 1987a). By comparison, the primate most studied with regard to this trait, *Homo sapiens*, has an albinism rate of less than 1%, ranging from 1 in 832 (Lund *et al.* 2007) to 1 in 17,000 (King & Summers 1988). As such, despite the potential for bias in the museum specimen collection, the frequency with which this apparent pigment deficiency occurs in the wild suggests the condition is more common in mangabeys than previously recognized.

A multitude of disadvantages exist for individuals with physically distinguishing morphologies, often increasing the potential negative effects on their fitness and survival (Laikre *et al.*, 1996; Caro, 2005). One such hindrance is poor vision, but fortunately, individuals with leucism are not prone to the visual acuity problems that albinos experience, a documented deficit in both humans and other mammals exhibiting albinism. In addition to the potential for visual deficiencies, the less cryptic pelage may result in increased predation of albinistic and leucistic individuals, compared to conspecifics, due to ease of detection by predators. For instance, *Lophocebus* are highly vulnerable to aerial predation by the crowned hawk-eagle *Stephanoaetus*

coronatus (Mitani *et al.*, 2001); Horn (1987a) observed a total of 31 aerial attacks on black mangabeys over a two-year period. Likely terrestrial predators include the golden cat *Profelis aurata* and leopard *Panthera pardus* (Hart *et al.*, 1996). New evidence also now suggests that bonobos *Pan paniscus* may prey on *L. aterrimus*, based on discovery of a black mangabey digit in the feces of *P. paniscus* (Surbeck & Hohmann, 2008; Surbeck *et al.*, 2009). All of these predators rely heavily on ocular detection of prey (Kirk & Kay, 2004; Mitani *et al.*, 2001; Sunquist & Sunquist, 2002), thereby potentially increasing the risk of predation for albinistic and leucistic individuals that visually contrast with the surrounding tree canopy more than normal black mangabeys.

Perhaps the greatest imbalance in predation risk between the morphs stems from a preference by local hunters. Individuals exhibiting white or buff in their pelage apparently are favored due to the rarity of their pelt. Black mangabeys are often a target of the lucrative commercial bushmeat trade as they are gregarious and exceptionally vocal throughout the forest canopy, making detections of them relatively effortless. In a country with over 22 million people living in the forests, it is estimated that the Congolese population consumes over one billion kilograms of bushmeat each year (Wilkie & Carpenter, 1999). This results in an average consumption of 897 kg per km²/yr, with 5-40% of the total derived from primates (Wilkie & Carpenter, 1999). Moreover, the DRC experiences a population growth rate of roughly 2.4%yr⁻¹, ensuring that bushmeat consumption will continue to rise (Fa *et al.*, 2003). Population declines have been documented in a closely related large-bodied congener, the allopatric grey-cheeked mangabey *L. albigena*. Conspecifics showed drastically lower densities in hunted (<3/km²) vs. non-hunted (≥51/km²) sites (Lahm, 1994), suggesting unsustainable hunting pressure. In addition, the recent influx of readily accessible weapons and ammunition from the Congolese military augments the commercial bushmeat trade. It is not uncommon for two to three monkeys to be killed with one shotgun shell, making the endeavor more economically feasible than hunting with poison arrows, as occurred in the past (Horn, 1987a). The desirability and detectability of the white pelage, in conjunction with increased bushmeat hunting pressure, may result in disproportionately high harvest rates of these white *Lophocebus*. Should such uneven harvest rates exist, they may serve to depress the numbers of buff *Lophocebus*. The question then arises as to how a potentially disadvantageous characteristic can occur at a relatively high frequency.

The observations of albino and leucistic black mangabeys within the Lomako-Yokokala Faunal Reserve suggest topics for potential future research on the behavioral ecology, fitness, and survival of conspecifics with morphologically distinguishing characteristics. Although this occurrence would appear to be anomalous,

the relatively high frequency at which it is exhibited is of interest to prospective genetic studies, especially as to how and why populations would retain genetic diversity that includes apparently disadvantaged color morphologies. Because of the likely disproportionate effect of bushmeat hunting on albino and leucistic black mangabeys, conservation research should seek to understand if and how these genotypes contribute to the genetic diversity and the persistence of the population as a whole.

ACKNOWLEDGEMENTS

We thank Pasteur Cosma Wilungula Balongelwa, Gustave Tuka Muda, Principal Conservator Nayifilua, and Floribert Botamba for coordinating our work with their respective agencies, the Congolese Institute for the Conservation of Nature (ICCN), the Congolese Ministry of Scientific Research, the Lomako-Yokokala Faunal Reserve, and the African Wildlife Foundation (AWF). Robert Mujinga, the Chief Administrator of the Territory of Bongandanga facilitated community acceptance of our presence and generously provided secure housing. We warmly thank Gay Reinartz and the Zoological Society of Milwaukee, including Stefanie McLaughlin and Ntuntani Etienne, for their guidance and collegial support throughout - we are eternally grateful. We greatly appreciate the hospitality and assistance of Terese Hart and TL2. Special thanks to Samy Iloko-Nsonge, Seraphin Boongo, and Joseph Lokuli-Lokuli who assisted with species identification, communication with local populations, and transect preparation, along with numerous other assistants. Funding for field research was provided by the U.S. Fish and Wildlife Service – Great Ape Conservation Fund (98210-8-G654) to J. Carroll, N. Nibbelink & J. Hickey; a research fellowship from the Wildlife Conservation Society (WCS) to J. Hickey; and a small grant from Global Forest Science to N. Nibbelink, J. Carroll, & J. Hickey. IDEA WILD provided essential field gear. AWF and WCS provided logistical support in country. Notable thanks must go to Jef Dupain and Tabu Senga of AWF and to Richard Key Tshombe of WCS for generous and efficient support and security.

LITERATURE CITED

- Caro, T. 2005. The adaptive significance of coloration in mammals. *BioScience* 55: 125-136.
- Chalmers, N.R. 1968. Group composition, ecology and daily activities of free living mangabeys in Uganda. *Folia Primatologica* 8: 247-262.
- Fa, J.E., D. Currie & J. Meeuwig. 2003. Bushmeat and food security in the Congo Basin: linkages between wildlife and people's future. *Environmental Conservation* 30(1): 71-78.
- Groves, C.P. 1978. Phylogenetic and population systematics of the mangabeys (Primates: Cercopithecoidea). *Primates* 19(1): 1-34.
- Groves, C.P. 2001. *Primate Taxonomy*. Smithsonian Institution Press, Washington, DC.
- Groves, C.P. 2007. The endemic Uganda mangabey, *Lophocebus ugandae*, and other members of the *albigena*-group (*Lophocebus*). *Primate Conservation* 22: 123-128.
- Grubb, P., T.M. Butynski, J.F. Oates, S.K. Bearder, T.R. Disotell, C.P. Groves & T.T. Struhsaker. 2003. Assessment of the diversity of African primates. *International Journal of Primatology* 24(6): 1301-1357.
- Hart, J., C.P. Groves & C. Ehardt. 2008. *Lophocebus aterrimus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 30 July 2010.
- Hart, J.A., M. Katembo & K. Punga. 1996. Diet, prey selection and ecological relations of leopard and golden cat in the Ituri Forest, Zaire. *African Journal of Ecology* 34: 364-379.
- Henson, A., D. Williams, J. Dupain, H. Gichohi, & P. Muruthi. 2009. The Heartland Conservation Process: enhancing biodiversity conservation and livelihoods through landscape-scale conservation planning in Africa. *Oryx* 43: 508-519.
- Horn, A.D. 1987a. The socioecology of the black mangabey (*Cercocebus aterrimus*) near Lake Tumba, Zaire. *American Journal of Primatology* 12: 165-180.
- Horn, A.D. 1987b. Taxonomic assessment of the allopatric gray-cheeked mangabey (*Cercocebus albigena*) and black mangabey (*C. aterrimus*): comparative socioecological data and the species concept. *American Journal of Primatology* 12: 181-187.
- Hu, F., J.M. Hanifin, G.H. Prescott & A.C. Tongue. 1980. Yellow mutant albinism: Cytochemical, ultrastructural, and genetic characterization suggesting multiple allelism. *American Journal of Human Genetics* 32(3): 387-395.
- Jehl, J.R. 1985. Leucism in eared grebes in western North America. *The Condor* 87(3): 439-441.
- King, R.A. & C.G. Summers. 1988. Albinism. *Dermatologic Clinics* 6(2): 217-28.
- Kirk, E.C. & R.F. Kay. 2004. The evolution of high visual acuity in the Anthropoidea. In *Anthropoid Origins: New Visions*. C.F. Ross & R.F. Kay, eds. Kluwer Academic/Plenum Publishing, New York. Pp. 539-602.
- Krecsák, L. 2008. Albinism and leucism among European Viperinae: a review. *Russian Journal of Herpetology* 15(2): 97-102.
- Lahm, S.A. 1994. Hunting and wildlife in northeastern Gabon: why conservation should extend beyond protected areas. Institut de Recherche en Ecologie Tropicale, Makokou, Gabon.
- Laikre, L., R. Andrén, H.-O. Larsson & N. Ryman. 1996. Inbreeding depression in brown bear *Ursus arctos*. *Biological Conservation* 76: 69-72.

- Lund, P.M., T.G. Maluleke, I. Gaigher & M.J. Gaigher. 2007. Oculocutaneous albinism in a rural community of South Africa: a population genetic study. *Annals of Human Biology* 34(4): 493-7.
- MayoClinic. 2010. <http://www.mayoclinic.com/health/albinism/DS00941/DSECTION=symptoms> accessed. May 12, 2010.
- Mitani, J.C, W.J. Sanders, J.S. Lwanga & T.L. Windfelder. 2001. Predatory behavior of crowned hawk-eagles (*Stephanoaetus coronatus*) in Kibale National Park, Uganda. *Behavioral Ecology and Sociobiology* 49(2-3): 187-195.
- Oates, J.F. 1996. *African Primates: Status Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.
- Olupot, W., C.A. Chapman, P.M. Waser & G. Isabirye-Basuta. 1997. Mangabey (*Cercocebus albigena*) ranging patterns in relation to fruit availability and the risk of parasite infection in Kibale National Park, Uganda. *American Journal of Primatology* 43(1): 65-78.
- Omasombo, V, D. Bokelo & J. Dupain. 2005. Current status of bonobos and other large mammals in the proposed forest reserve of Lomako-Yokokala, Equateur Province, Democratic Republic of Congo. *Pan Africa News* 12(2): 14-17.
- Sunquist, M.E. & F. Sunquist. 2002. *Wild Cats of the World*. University of Chicago Press, Chicago.
- Surbeck, M, A. Fowler, C. Deimel & G. Hohmann. 2009. Evidence for the consumption of arboreal, diurnal primates by bonobos (*Pan paniscus*). *American Journal of Primatology* 71(2): 171-174.
- Surbeck, M. & G. Hohmann. 2008. Primate hunting by bonobos at Lui Kotale, Salonga National Park. *Current Biology* 18(19): R906-R907.
- Wilkie, D.S. & J.F. Carpenter. 1999. Bushmeat hunting in the Congo Basin: An assessment of impacts and options for mitigation. *Biodiversity and Conservation* 8(7): 927-955.

AUTHORS' CONTACT INFORMATION

Corresponding Author: T.M. Eppley, Warnell School of Forestry and Natural Resources, University of Georgia, 180 E. Green Street, Athens, Georgia 30602 USA. Email: eppleyti@gmail.com

J.R. Hickey, Warnell School of Forestry and Natural Resources, University of Georgia, 180 E. Green Street, Athens, Georgia 30602 USA. Email: hickeyj@warnell.uga.edu

N.P. Nibbelink, Warnell School of Forestry and Natural Resources, University of Georgia, 180 E. Green Street, Athens, Georgia 30602 USA. Email: nate@warnell.uga.edu



A victim of the increasing pet trade, a young juvenile black mangabey is kept in a small fishing village along the southern bank of the Lomako River, DRC

Photograph by T.M. Eppley
