Aberrant plumage in a Black-crowned Night Heron (*Nycticorax nycticorax*) from the Dominican Republic

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Abstract

The Black-crowned Night Heron (*Nycticorax nycticorax*) is one of the most widely distributed heron species worldwide, absent only from Australasia and the far northern Holarctic. Notable for its pronounced phenotypic and genetic variability in plumage, the species occasionally exhibits rare chromatic aberrations such as melanism, leucism and albinism. These phenomena provide valuable insights into adaptability, underlying genetic mechanisms and ecological and evolutionary implications. Here, we summarize the frequency and geographic distribution of documented plumage aberrations of the Black-crowned Night Heron, with emphasis on melanism, and present a field record from the Copey wetlands, northern Hispaniola. The observed individual exhibited predominantly rufous wing plumage reminiscent of the Nankeen Night Heron (*Nycticorax caledonicus*), yet its head and neck coloration were more consistent with Black-crowned Night Heron. Based on morphology, geographic distribution and regional biogeography, aberrant plumage is considered more likely than hybridization. Genetic analysis is recommended to confirm this hypothesis.

Key words: Ardeidae, Caribbean, Copey wetlands, Hispaniola, hybridization, Insular tropics, melanism, phenotype.

Introduction

The Black-crowned Night Heron (*Nycticorax nycticorax*) is cosmopolitan in distribution, with the exception of Australasia and extreme northern Holarctic regions (Hothem *et al.* 2020). Substantial intra- and inter-population variations in plumage patterns can be attributed to genetic and environmental influences. Rare chromatic aberrations—including melanism, leucism and albinism—have been documented sporadically (Pitelka 1938, Guay *et al*. 2012, Hothem *et al.* 2020, Luo *et al*. 2022).

Accurate documentation of such aberrations is essential for understanding species adaptability, genetic architecture of plumage pigmentation and ecological and evolutionary pressures that maintain or eliminate variant phenotypes (Sullivan *et al.* 2009, Ng and Li 2018, López *et al*. 2024). This study reports a distinctive individual observed in the Copey wetlands of the Dominican Republic and examines the likelihood of hybrid origin versus plumage aberration within the framework of species biology and biogeography.

Field Observations

On 18 September 2024, as part of the Integrated Marine Ecosystem Management (IMEM) project in northern Hispaniola, we conducted an initial waterfowl survey at a lagoon within the Copey wetlands, near the community of Copey, Montecristi Province (19° 40′ 35.58″ N, 71° 40′ 18.15″ W; population 4,000; Oficina Nacional de Estadística 2023).

The dominant vegetation is cattails (*Typha* sp.), water hyacinth (*Eichhornia crassipes*) and other aquatic macrophytes interspersed with grasses and mesquite (*Prosopis pallida*) (Cano-Ortiz *et al.* 2018). The wetland supports several Yellow-crowned Night Herons (*Nyctanassa violacea*) and numerous Black-crowned Night Herons. Additional recorded species included the Roseate Spoonbill (*Platalea ajaja*), multiple Anatidae, *Calidris* spp. and representatives of Rallidae.

At 18:24 hr, LRP observed and photographed a heron perched on a mound of Bermuda grass (*Cynodon dactylon*) in the center of the lagoon (Fig. 1). The individual remained stationary for several minutes before departing for the northwest. Weather conditions included a mild breeze and 50% cloud cover.

Results

Field observations, subsequently verified through photographic documentation, initially suggested that the individual in question was a juvenile Black-crowned Night Heron approximately two years old. This assessment was aligned with general expectations for the species at that age. However, closer scrutiny revealed that several plumage characteristics diverged from those of the typical juvenile phenotype (Appendix 1). In particular, the wings exhibited a predominantly rufous tone, an attribute more characteristic of Nankeen Night Heron (*Nycticorax caledonicus*) (Lepage n.d., Marchant and Higgins 1990, Martínez-Vilalta *et al.* 2021, BirdLife International 2024), whereas the head and neck coloration remained consistent with Black-crowned Night Heron (Fig. 1). This combination of traits prompt-ed further consideration of additional explana-tions, including hybridization, long-distance vagrancy and the potential involvement of escapees from captivity (Spendelow and Patton 1988).

To evaluate these possibilities, it is important to note that Nankeen Night Heron occurs naturally only within the Australasian region (Hothem *et al.* 2020, Australian Birds 2024), where populations are either sedentary or partially migratory (Lepage n.d., Frost 2013, Martínez-Vilalta *et al.* 2021). Although infrequent cases of long-distance vagrancy in the Nankeen Night Heron have been documented (Pratt *et al*. 1987, Marchant and Higgins 1990, del Hoyo *et al*. 1992, Frost 2013, Heather and Robertson 2015, such dispersal events remain exceptional within the species' natural history. Consequently, the likelihood of natural hybridization between Nankeen Night Heron and Black-crowned Night Heron in the Caribbean is low.

Atmospheric transport mechanisms were also assessed as a potential explanation for the pres-

Figure 1. Aberrant-plumaged night heron photographed on 18 September 2024 in the Copey wetlands, Dominican Republic (19° 40′ 35.58″ N, 71° 40′ 18.15″ W). Several intra- and interspecific plumage characteristics were noted (Photo by Luis R. Paulino).

ence of the night Heron. Prevailing largescale circulation patterns—most notably the subtropical jet stream—are oriented primarily west–east, making them unsuitable for facilitating inter-hemispheric movement from Australasia to the Caribbean (Xie *et al.* 2015). Likewise, trans-equatorial cyclone transport is highly improbable, as the wind regimes in the two hemispheres operate in opposing directions (Kuleshov *et al.* 2008). Taken together, these distributional and meteorological constraints suggest that neither natural hybridization nor passive atmospheric transport offer a plausible explanation for the observed plumage anomaly.

Discussion

From the combined weight of field observations, photographic evidence and expert consultation (H. van Grouw, pers. comm.), the Copey wetlands individual is plausibly interpreted as a melanistic, or otherwise pigment-aberrant, Black-crowned Night Heron, rather than a hybrid with Nankeen Night Heron. This hypothesis rests on the recognition that aberrant plumage phenotypes in herons can arise through well-characterized genetic mechanisms (Ng and Li 2018). Specifically, recessive alleles or mutations in pigmentation-related loci, most notably *MC1R* (melanocortin1 receptor), which regulate eumelanin synthesis, and *ASIP* (agouti signaling protein), which

modulates the spatial distribution of melanin, are known to alter feather coloration (van Grouw 2013, 2017, Ng and Li 2018, Jeon *et al.* 2021). These genetic factors may act independently or interact with environmental factors, such as diet or habitat conditions, to produce atypical plumage expression (Ng and Li 2018).

Understanding the ecological and evolutionary context of chromatic aberrations is critical for interpreting their occurrence in herons, as recent syntheses highlight the ecological functions and evolutionary origins of plumage variation (Mason and Bowie 2020, Harris *et al.* 2019). Melanism has been investigated as an adaptive trait conferring crypsis (Bennett and Théry 2007, van Grouw 2017, Harris *et al.* 2019), thermoregulatory benefits under variable thermal regimes (Britton and Davidowitz 2023), and roles in social signaling and correlated physiological traits (Ducrest *et al.* 2008, Roulin 2004). Yet these advantages are not universal, as context-dependent neutrality or even disadvantages have been documented, with melanin plasticity yielding no clear benefit in certain environments (Britton and Davidowitz 2023), pleiotropic trade-offs constraining adaptive value (Roulin 2004) and macroecological analyses showing that melanism distributions are strongly habitat-dependent (da Silva *et al.* 2017). In Black-crowned Night Heron, melanism is rare, estimated at less than 1% of the observed individuals, with higher frequencies documented in geographically isolated or demographically bottlenecked populations (Hothem *et al.* 2020). More broadly, other pigmentary anomalies, including leucism and albinism, have been reported in colonies in urban wetlands and coastal rookeries worldwide (Kushlan and Hancock 2005, Hothem *et al.* 2020), indicating that aberrant coloration is not unique to this case.

From a biochemical perspective, avian melanin pigmentation is derived from two primary pigment types: eumelanin, which produces black to gray tones, and phaeomelanin, which yields warm brown, tan and rufous hues (McGraw *et al.* 2004). The pronounced rufous coloration in the wing plumage of the Copey wetland bird suggests a substantial phaeomelanin component. However, without molecular data, such as targeted sequencing of *MC1R*, *ASIP*, or other pigmentation-associated genes, any definitive classification of this individual, whether as a hybrid or as a pigment-aberrant Black-crowned Night Heron, is provisional.

Given these uncertainties, the next step is to prioritize genetic sampling of aberrant individuals, combined with systematic phenotypic monitoring of Caribbean Black-crowned Night Heron populations. Such an approach would allow researchers to quantify the prevalence of pigmentary variation, map its geographic distribution and identify the potential genetic or ecological drivers.

This record is presented with two complementary aims: first, to document the occurrence of this anomalous heron, whether ultimately determined to be a vagrant hybrid or a resident Black-crowned Night Heron exhibiting pigmentary aberration; and second, to stimulate further discourse within the ornithological community. By establishing a clear public record, we also provided a reference point for comparison; similar phenotypes should be reported in the region in the future.

Acknowledgements

This research was financially and logistically supported by the USDA Forest Service, the International Institute of Tropical Forestry, San Juan, Puerto Rico, and the Integrated Marine Ecosystem Management (IMEM) project in Northern Hispaniola (PAPA No. 72051719CA 00004). We extend our sincerest gratitude to Jerry Bauer (Program Director, USFS-IITF/Inter-

national Cooperation) for his guidance, notably for his commendable dedication and consistent technical support, inter-agency managerial skill set, and global multimedia dissemination of our research and conservation education materials. We also thank Harry R. Recher for his meticulous and thoughtful review of the manuscript. We thank the editorial staff for their thoughtful and rigorous evaluation, attentive review, and steady guidance throughout the preparation and revision of this manuscript.

Literature Cited

Australian Birds. 2024. Rufous (Nankeen) Night-Heron *Nycticorax caledonicus*. Australian Birds database, version 2024, Australian Birds, Canberra, Australia.

Bennett, A. T. D. and M. Théry. 2007. Avian color vision and coloration: Multidisciplinary evolutionary biology. American Naturalist 169: S1-S6.

BirdLife International. 2024. Species factsheet: Nankeen Night-Heron *Nycticorax caledonicus*. [online] datazone.birdlife.org/species/factsheet/nankeen-night-heron-nycticorax-caledonicus. Accessed 11 January 2025.

Britton, S. and G. Davidowitz. 2023. The adaptive role of melanin plasticity in thermally variable environments. Journal of Evolutionary Biology 36: 1811-1821.

Cano-Ortiz, A., C. M. Musarella, J. C. Piñar Fuentes, C. J. Pinto Gomes and E. Cano. 2018. Advances in the knowledge of the vegetation of Hispaniola (Caribbean Central America). Pages 1-24 *in* Vegetation of Central America (M. Kappelle, ed.). InTechOpen, London, U.K.

da Silva, L. G., K. Kawanishi, P. Henschel, A. Kittle, A. Sanei, A. Reebin, D. Miquelle, A. B. Stein, A. Watson, L. B. Kekule, R. B. Machado and E. Eizirik. 2017. Mapping black panthers: Macroecological modeling of melanism in leopards (*Panthera pardus*). PLOS ONE 12: e0170378.

del Hoyo, J., A. Elliott, and J. Sargatal (eds.). 1992. Handbook of the Birds of the World, Volume 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.

Ducrest, A.-L., L. Keller and A. Roulin. 2008. Pleiotropy in the melanocortin system: melanism correlates with behaviour, physiology and life history traits. Trends in Ecology & Evolution 23: 502-510.

Frost, P. G. H. 2013 [updated 2025]. Nankeen night heron | Umu kōtuku. *In* New Zealand Birds Online (C. M. Miskelly, ed.). [online] www.nzbirdsonline.org.nz/species/nankeen-night-heron. Accessed 11 January 2025.

Guay, P. J., D. A. Potvin and R. W. Robinson. 2012. Aberrations in plumage coloration in birds. Australian Field Ornithology 29: 23-30.

Harris, R. B., K. Irwin, M. R. Jones, S. Laurent, R. D. H. Barrett, M. W. Nachman, J. M. Good, C. R. Linnen, J. D. Jensen and S. P. Pfeifer. 2019. The population genetics of crypsis in vertebrates: recent insights from mice, hares, and lizards. Heredity 123: 305-318.

Heather, B. and H. Robertson. 2015. The Field Guide to the Birds of New Zealand. Penguin Random House, Auckland, New Zealand.

Hothem, R. L., B. E. Brussee, W. E. Davis, Jr., A. Martínez-Vilalta, A. Motis and G. M. Kirwan. 2020. Black-crowned Night Heron *Nycticorax nycticorax*. *In* Birds of the World, v. 1.0. (S. M. Billerman, ed.). Cornell Lab of Ornithology Ithaca, New York, U.S.A.

Jeon, D.-J., S. Paik, S. Ji and J.-S. Yeo. 2021. Melanin-based structural coloration of birds and its biomimetic applications. Applied Microscopy 51: 1-11.

Kuleshov, Y., L. Qi, R. Fawcett and D. Jones. 2008. On tropical cyclone activity in the Southern Hemisphere: Trends and the ENSO connection. Geophysical Research Letters 35: L14S08.

Kushlan, J. A. and J. A. Hancock. 2005. The herons. Oxford University Press, Oxford, U.K.

Lepage, D. n.d. Nankeen Night Heron. Avibase: the world bird database. [online] avibase.bsc-eoc.org/species.jsp?avibaseid=fdd00863c1103132. Accessed 5 January 2025.

López, L. I., J. M. Mora and A. A. Rivera. 2024. Color aberrations in seven bird species in Costa Rica. Ornitología Neotropical 35: 55-62.

Luo, H., S. Luo, W. Fang, Q. Lin, X. Chen and X. Zhou. 2022. Genomic insight into the nocturnal adaptation of the black-crowned night heron (*Nycticorax nycticorax*). BMC Genomics 23: 683.

Marchant, S. and P. J. Higgins (eds.). 1990. Nankeen night heron (*Nycticorax caledonicus*). Pages 625-637 *in* Handbook of Australian, New Zealand and Antarctic Birds, v. 1: Ratites to Ducks. Oxford University Press, Melbourne, Australia.

Martínez-Vilalta, A., A. Motis and G. M. Kirwan. 2021. Nankeen Night Heron (*Nycticorax caledonicus*). *In* Birds of the World, v. 1.0. (S. M. Billerman, ed.). Cornell Lab of Ornithology Ithaca, New York, U.S.A.

Mason, N. A. and R. C. K. Bowie. 2020. Plumage patterns: Ecological functions, evolutionary origins, and advances in quantification. Ornithology 137: 1-29.

McGraw, K. J., K. Wakamatsu, S. Ito, P. M. Nolan, P. Jouventin, F. S. Dobson, R. E. Austic, R. J. Safran, L. M. Siefferman, G. E. Hill and R. S. Parker. 2004. You can't judge a pigment by its color: Carotenoid and melanin content of yellow and brown feathers in swallows, bluebirds, penguins, and domestic chickens. The Condor 106: 390-395.

Ng, C. S. and W.-H. Li. 2018. Genetic and molecular basis of feather diversity in birds. Genome Biology and Evolution 10: 2572-2586.

Oficina Nacional de Estadística (ONE) 2023. Tu municipio en cifras: Monte Cristi. Oficina Nacional de Estadística, Santo Domingo, República Dominicana.

Pitelka, Frank A. 1938. Melanism in the Black-crowned Night Heron. The Auk 55: 518-519.

Pratt, H. D., D. G. Bruner and D. Berrett. 1987. A field guide to the birds of Hawaii and the Tropical Pacific. Princeton University Press, Princeton, New Jersey.

Roulin, A. 2004. The evolution, maintenance and adaptive function of genetic colour polymorphism in birds. Biological Reviews 79: 815-848.

Spendelow, J. A. and S. R. Patton. 1988. National atlas of coastal waterbird colonies in the contiguous United States, 1976-82. U.S. Fish and Wildlife Service Biological Report 88. U.S. Department of the Interior, Washington, D.C., U.S.A.

Sullivan, B. L., C. L. Wood, M. J. Iliff, R. E. Bonney, D. Fink and S. Kellinge. 2009. eBird: A citizen-based bird observation network in the biological sciences. Biological Conservation 142: 2282-2292.

van Grouw, H. 2013. What colour is that bird? The

causes and recognition of common colour aberrations in birds. British Birds 106: 17-29.

van Grouw, H. 2017. The dark side of birds: melanism—facts and fiction. Bulletin of the British Ornithological Club 137: 12-36.

Xie, Z., Y. Du and S. Yang. 2015. Zonal extension and retraction of the subtropical westerly jet stream and evolution of precipitation over East Asia and the Western Pacific. Journal of Climate 28: 6783-6798.

Appendix 1. Character-based key to Nycticorax species and aberrant plumaged phenotype.

Character description*	*Nycticorax nycticorax* (nominate)	*N. n. obscurus*	*N. caledonicus*
Crown and nape	ad. – black; juv./imm. – brown to gray brown	ad. – pale gray; juv./imm. – streaked dark brown to sooty brown	ad. – gray to black; juv./imm. – streaked brown crown and nape
Iris	ad. – bright red to crimson; juv./imm. – yellow to yellow orange or greenish tinge in young birds	ad. – red to deep red; juv./imm. – yellow to orange-to-orange red	ad. – straw yellow; juv./imm. – duller yellow or yellow orange
Upper mandible	ad. – black; juv./imm. – black dorsally but with yellow or horn yellow along the tomia	ad. – black; juv./imm. – dark horn to dusky brown	ad. – black; juv./imm. – dark gray above, grading to olive yellow below, with a dark gray tip
Lower mandible	ad. – yellow to yellow green base, black tip; juv./imm. – dull yellowish horn to grayish horn base, dusky to blackish tip	ad. – yellow to yellow green base, black tip; juv./imm. – dull yellowish horn to gray olive base, with a dusky to blackish tip	ad. – pale yellow to yellow green base, black tip; olive yellow base, dark gray tip
Facial and throat pattern	ad. – white face, lores yellow green (nonbreeding), deep blue (breeding); juv./imm. – brownish face with buff or whitish streaks, lores dull yellow green	ad. – dusky whitish to pale gray, lores dull greenish yellow (nonbreeding) to deep blue (breeding); juv./imm. – dark brownish gray with buff or whitish streaks; lores dull yellow green	ad. – white, with a cinnamon/rufous wash, lores green yellow (nonbreeding) or blue (breeding); juv./imm. – rufous brown with buff and whitish spotting/streaking, lores yellow olive

Appendix 1. (continued)

Character description*	*Nycticorax nycticorax* (nominate)	*N. n. obscurus*	*N. caledonicus*
Upper breast	ad. – uniform white to pale gray; juv./imm. – buff to pale brown with heavy brown streaking	ad. – uniformly dark (brown gray/slate gray); juv./imm. – streaked gray brown breast	ad. – cream with burnt orange/rufous wash; juv./imm. – brown streaked, paler ground, with rufous tinge
Abdomen	ad. – white to pale gray; juv./imm. – pale buff white base heavily streaked with dark brown	ad. – uniform dusky pale gray to gray white; juv./imm. – buff white base with dense dark brown streaking	ad. – white to creamy white; juv./imm. – buff white to creamy base with dense brown streaking
White feathers visible at wing fold below scapulars	ad. – conspicuous, clean white patch; juv./imm. – white patch absent or very reduced	ad. – small to moderately sized dull white patch; juv./imm. – absent as a clean patch; area mottled brown with buff and off-white spotting	ad. – small but distinct white area; juv./imm. – no discrete white patch, area mottled rufous brown with buff and whitish spotting
Primaries	ad. – uniform medium gray; juv./imm. – dark brown with conspicuous pale buff/whitish spotting along outer webs	ad. – uniform dark slate gray; juv./imm. – dark brown, with pale buff to whitish spotting	ad. – rich rufous chestnut to cinnamon brown; juv./imm. – dusky brown primaries, pale buff to whitish spotting or mottling on outer webs and tips
Narrow white edging to proximal vein of tertials	ad. – absent, tertials plain gray; juv./imm. – present, narrow, pale buff to whitish	ad. – absent, tertials plain, dark slate gray to blackish; juv./imm. – present, narrow, pale buff to whitish	ad. – absent, tertials plain rich rufous chestnut; juv./imm. – present, narrow pale buff to whitish
Whitish-gray tarsi and feet	ad. – pale yellow to yellow green (nonbreeding), may flush pink to red (breeding); juv./imm. – whitish gray to olive gray	ad. – pale yellow to yellow green (nonbreeding), may flush pink to red (breeding); juv./imm. – whitish gray to olive gray	ad. – creamy yellow to yellow (nonbreeding, brighter yellow (breeding); juv./imm. – dull yellow green to olive gray, pale grayish in strong light

*** Hothem *et al.* 2020, Martínez-Vilalta *et al.* 2021, Australian Birds 2024, BirdLife International 2024.**