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Novel plumage aberrations in Paraguayan non-Passerine Birds, and the definition of a new plumage aberration unique to Psittacidae

Nuevas aberraciones de plumaje en aves paraguayas no passeriformes y la definición de una nueva aberración de plumaje única a Psittacidae

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Abstract

Anomalous plumage colourations are reported for three species of non-passerine birds from Paraguay, Limpkin (*Aramaus guarauna*; Aramidae), Nanday Parakeet (*Nandayus nenday*; Psittacidae), and the Little Woodpecker (*Veniliornis passerinus*; Picidae). A leucistic Limpkin is the first published report of a colour anomaly for the family Aramidae. The colour aberration in *N. nenday* is hypothesised to be a result of an excess of red psittacofulvin pigments, which are unique to the Psittacidae. Although the mechanisms causing this colour aberration remain unknown, we suggest the term psittacofulvism for the phenotypic effect observed.

Key words: albinism, ino mutation, erythrism, leucism, Limpkin, Little Woodpecker, Nanday Parakeet, psittacofulvism.

Resumen

Se reportan anomalías en la coloración de tres aves no passeriformes del Paraguay, caraú *Aramus guarauna* (Aramidae), ñanday *Nandayus nenday* (Psittacidae) y carpinterito oliváceo *Veniliornis passerinus* (Picidae). Un caraú leucístico es el primer reporte publicado de coloración anómala en Aramidae. La presencia de coloración aberrante en *Nandayus* se hipotetiza como resultado de un exceso de pigmentos psittacofulvinos rojos, únicos a los Psittacidae. Aunque el mecanismo causante de esta aberración de color sigue siendo desconocido, sugerimos el término psittacofulvismo para el efecto fenotípico observado.

Palabras claves: albinismo, Caraú, Carpinterito oliváceo, eritrismo, leucismo, mutación ino, Ñanday, psittacofulvismo.

INTRODUCTION

In birds, plumage anomalies may be caused by differing amounts and distributions of the pigments usually present, chemical changes to pigments resulting in abnormal colours, changes in feather structure (Harrison, 1985) or genetic, environmental or dietary factors (Dorst, 1971; Gonçalves Jr. et al., 2008). Though well documented and probably not uncommon in nature (Hosner & Lebbin, 2006), individuals exhibiting plumage aberrations may find themselves at a selective disadvantage (Møller & Mousseau, 2001), being short-lived and consequently rarely observed. Aberrant individuals are not only more conspicuous to predators, but reduced pigmentation weakens feather structure causing accelerated wear and affecting mobility (Harrison, 1985). Additionally such individuals may suffer harassment from conspecifics (Nero, 1954; Harris, 1983; Withgott & McMahon, 1993).

The most extreme variations of abnormal pigmentation occur in individuals that show marked reductions or increases in the normal levels of pigments present in the feathers (Harrison, 1985). For example an excess of melanins may result in extremely dark or melanistic individuals, whilst an excess of carotenoids may result in unusually widespread chestnut pigmentation, an effect known as erythrism or erythromelanism (Hosner & Lebbin, 2006). Psittacids owe their red, orange and yellow plumage colours to a distinct group of pigments known as psittacofulvins which are synthesised within maturing feather follicles (Stradi et al., 2001; McGraw & Nogare, 2005).

A lack of melanins may cause individuals to appear wholly or partially white-feathered (Harrison, 1963; Harrison, 1985). However, in some cases areas of the plumage which naturally contain yellow or red carotenoid pigments may persist on otherwise white-coloured plumage (Harrison, 1963). Where yellow or red pigments

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are absent in normal-coloured individuals, they may appear completely white (Van Grouw, 2006).

Individuals with a complete absence of melanins appear red-eyed because blood vessels are visible through the retina. Such individuals are commonly referred to as albinos and suffer from impaired vision in bright light (Van Grouw, 2006). Albinism is defined as a total lack of melanin in feathers, eyes and skin as a result of genetic absence of tyrosinase, the enzyme responsible for melanin production (Fox & Vevers, 1960; Van Grouw, 2006). Because of the physiological complications associated with the condition, it is extremely rare in adult birds (Van Grouw, 2006). Incorrect usage of the term albinism, particularly in the older literature, has led to a general confusion of true albinos with both leucistic and ino individuals (Zapata & Novatti, 1979).

Birds showing areas of pure white unpigmented plumage but with a pigmented iris are properly referred to as leucistics (Van Grouw, 2006). All specimens referred to as "partially albino" in the literature are in fact leucistic, the physiological causes of albinism dictating that partial albinism cannot exist. Leucistic individuals do not completely lack pigmentation, and their anomalous colouration is most often confined to the feathers only, as the abnormality is due to defects in the chromatophores (Gonçalves Jr. et al., 2008). Leucism affects all plumage

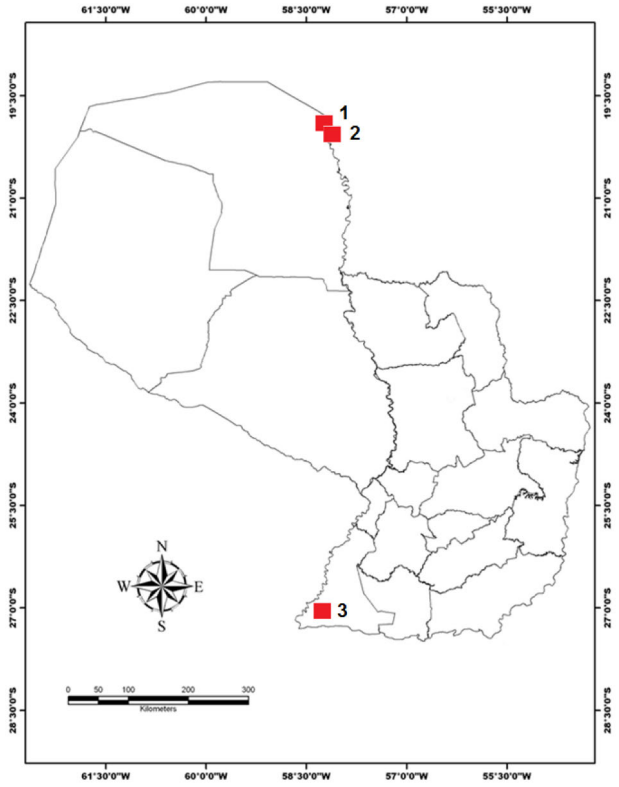

Figure 1: A map of localities mentioned in the text. 1) Mouth of the Río Negro, Alto Paraguay Department. 2) Tres Gigantes Biological Station, Alto Paraguay Department. 3) Paso Pindó, Ñeembucú Department.

Figura 1: Mapa de las localidades citadas en el texto. 1) Boca del Río Negro, Departamento de Alto Paraguay. 2) Estación Biológica Tres Gigantes, Departamento de Alto Paraguay. 3) Paso Pindó, Departamento de Ñeembucú.

pigments, not just melanins and is probably the commonest plumage aberration (Van Grouw, 2006), though estimates suggest that leucistic individuals account for no more than 1% of wild populations (Sage, 1963; Bensch et al., 2000). Leucism is more common in some families than others (Gross, 1965) and may be more prevalent in species that are both social in their breeding habits and sedentary (Sage, 1963). Typically it is more often observed in passerines than non-passerines (Gross, 1965). The fully pigmented iris means that leucistic individuals do not suffer from problems with sight experienced by albinos and hence have a much lower mortality rate (Van Grouw, 2006).

The ino mutation results in a phenotype that is similar to that of albinism, and hence, they are frequently confused. Ino birds in fresh plumage show a trace of the natural plumage in highly dilute form and plumage parts that show the highest pigmentation levels in normal individuals remain the most clearly visible. Though ino birds also have red irises, they do not have impaired eyesight, and hence, have a higher survival rate in nature than albinos, to the point that all adult birds showing albino-like characteristics can be confidently assumed to be inos (Van Grouw, 2006). Ino colouration is recessively sex-linked and therefore all ino birds are female (Van Grouw, 2006).

Little has been published on plumage anomalies in Paraguayan birds (Insfrán, 1931; Etchegaray, et al. 2016; Smith, 2016). Herein, we provide a photograph and a descriptive and qualitative report of some significant additional plumage aberrations in three Paraguayan non-passerine birds: Limpkin *Aramus guarauna* (Linnaeus, 1776), Nanday Parakeet *Nandayus nenday* (Vieillot, 1823), and the Little Woodpecker *Veniliornis passerinus* (Linnaeus, 1776).

MATERIALS AND METHODS

Descriptions and illustrations of plumage anomalies observed in Paraguayan non-passerines during continuous field campaigns in the country since 2005 are provided. The observations of the anomalous Nanday Parakeet and Little Woodpecker were made by the senior author in July 2011 and August 2012, respectively, both of them in the Pantanal of Alto Paraguay Departament. A leucistic Limpkin was photographed by Sebastián Peña Escobar in August 2006 in Ñeembucú Department, and the photograph was later sent to the authors for examination. Identifications of the anomalies exhibited were based on information and classification provided by Van Grouw (2006). Nomenclature follows SACC (2017). A map of the localities mentioned in the results is given in Fig. 1.

RESULTS AND DISCUSSION

Limpkin *Aramus guarauna* (Linnaeus, 1766) (Galliformes: Aramidae)

A fully leucistic Limpkin (Fig. 2) was photographed by Sebastián Peña Escobar (http://www.pybio.org) at Paso Pindó, Ñeembucú Departament on 13 August 2006 in Humid Chaco swamps. Neither Gross (1965) nor Bryan

Figure 2: Leucistic Limpkin. Paso Pindó, Ñeembucú. Photograph: S. Peña Escobar.

Figura 2: Caraú leucístico. Paso Pindó, Ñeembucú. Fotografía: S. Peña Escobar.

(2002) mention any previous reports of plumage aberrations in this species (and hence family) and this appears to be the first report of leucism in the Limpkin.

Nanday Parakeet *Nandayus nenday* (Vieillot, 1823) (Psittaciformes: Psittacidae)

An unusually red-coloured Nanday Parakeet (Fig. 3) was photographed near the mouth of the Río Negro, Alto Paraguay Department on 23 July 2011 (20°06'14.8" S, 58°08'34.0" W), an area dominated by palm savannas and Pantanal gallery forest. The individual was in a small flock of normally-coloured individuals with no apparent antagonistic reactions towards it. Normal black colouration was present on the head and wings, but much of the body colouration showed excessively anomalous red pigmentation. The sides of the head (which are normally green) and upper breast (which is normally turquoise) were a pale golden yellow, being replaced by a deep scarlet red on the rest of the underparts. In typical individuals such red colouration is restricted to the thighs. The wings showed some dull green colouration, though this was variably intermixed with tones of red and orange. The black bill and pink legs were normally coloured.

Red colouration in parrot feathers is attributable to a group of recently described lipid-soluble pigments endemic to psittacids known as psittacofulvins (Stradi et al., 2001) with the intensity of red colouration corresponding to the total pigment concentration. Psittacofulvins are not obtained via the diet (as are red carotenoids) and are probably synthesised locally at maturing feather follicles

Figure 3: Psittacofulvistic Nanday Parakeet. Río Negro, Alto Paraguay. Photograph: P. Smith.

Figura 3: Ñanday psittacofulvístico. Río Negro, Alto Paraguay. Fotografía: P. Smith.

Figure 4: Albino/ino Little Woodpecker. Tres Gigantes Biological Station, Alto Paraguay. Photograph: P. Smith.

Figura 4. Carpinterito oliváceo Albino/ino. Estación Biológica de Tres Gigantes. Alto Paraguay. Fotografía: P. Smith.

(McGraw & Nogare, 2004). Burtt et al. (2011) suggested that the effects of melanin and psittacofulvins are not additive and hence an excess of red colouration in otherwise green or grey feathers is not likely due to a suppression of melanins. Unknown factors instead appear to cause feather follicles to produce psittacofulvins in feathers where it would normally be absent.

A red factor African Grey Parrot *Psittacus erithacus* was described by Rensch (1925) and referred to by Harrison (1963). Rensch (1925) coined the term "lipochroismus" in reference to an effect in which typical grey feathers observed in this species were replaced by red feathers over successive moults. Teixeira (1981) calls "eritrismo" (erythrism) the "rarest" plumage aberration in wild Neotropical psittacids in his review and notes only a single record of a Blue-fronted Amazon *Amazona aestiva* showing excesses of red pigmentation. However despite a superficial similarity in the red-dominant phenotype to that seen in erythristic specimens, given the involvement of this newly described pigment group, such plumages cannot now be correctly attributed to erythrism.

From this single observation we are unable to comment on the physiological mechanisms leading to this mutation or indeed to confirm whether it is analogous to Rensch's "lipochroismus". The presence of normal black plumage does however provide support for Burtt et al.'s (2010) assertion that melanins are not being suppressed in this individual and that an excess of psittacofulvins is the cause of the unusual plumage. Consequently we propose the descriptive term psittacofulvism for the phenotypic effect observed.

Little Woodpecker *Veniliornis passerinus* (Linnaeus, 1766) (Piciformes: Picidae)

An albino/ino female Little Woodpecker (Fig. 4) was photographed on 29 August 2012 at Tres Gigantes Biological Station, Alto Paraguay Department (S 20° 04', W 58° 09') in Pantanal gallery forest. The plumage was not entirely white and normally greenish areas were replaced with a strong yellow colouration. A reddish iris and unpigmented pinkish-white bill are indications of albino/ino colouration. Such colouration results from a loss of melanins, revealing an extensive distribution of yellow carotenoid pigmentation that is usually masked by other pigments (Harrison, 1985).

The bird was seen on several occasions and was paired with a normally coloured male, with both members of the pair responding together when playback of the call was attempted. What was presumably the same individual had been photographed previously in the same area by Andrea Ferreira during February 2011. Albino individuals are rare in

nature and their physical defects means that few survive into adulthood (Harris, 1983; Van Grouw, 2006). The repeated observation of at least one albino/ino individual in this area raises the possibility that this individual may have persisted through at least one complete breeding season. Given that this bird is adult, may have survived for several years, shows traces of the normal colouration and is female, it would seem probable that this individual is an ino (Van Grouw, 2006).

CONCLUSION

Plumage aberrations are not particularly rare, but the number of published records greatly underestimates the frequency of occurrence (Gonçalves Jr. et al., 2008). Though taxonomically widespread, more remains to be learned about the abundance and frequency of these colour anomalies, including expanding the taxonomic and geographic inventory of their occurrence. The records reported here contribute towards that aim by providing the first reports of plumage aberrations in the monotypic New World family Aramidae, a definition of an apparently new plumage aberration unique to the Psittacidae and add to the national inventory of anomalous plumage patterns in birds from Paraguay.

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REFERENCES

Burtt Jr, E.H., Schroeder, M.R., Smith, L.A., Sroka, J.E., McGraw, K.J. 2010. Colourful parrot feathers resist bacterial degradation. Biology Letters 7: 214-216.

Bryan, D.C. 2002. Limpkin (*Aramus guarauna*) The Birds of North America, No. 627, In: Poole, A. Gill, F. (Eds.).The Birds of North America. Philadelphia, USA. doi: 10.2173/bna.627

Dorst, J. 1971. The life of birds, Volume 1. Weidenfield and Nicholson. London, UK.

Etchegaray, A.M., Benítez Riveros, C., Galluppi Selich, T., Irala Melgarejo, R., Rojas Barrios, S., Ruíz López, R. 2016. Aberración cromática en el Cardenal común (*Paroaria coronata*) en Paraguay. Nuestras Aves 61: 55-56.

Fox, H.M., Vevers, G. 1960. The nature of animal colours. Macmillan, New York, USA.

Gonçalves Junior, C.C., Da Silva, E.A., De Luca, A.C., Pongiluppi, T., De Barros Molina, F. 2008. Record of a leucistic Rufous-bellied Thrush *Turdus rufiventris* (Passeriformes, Turdidae) in São Paulo city, Southeastern Brazil. Revista Brasileira de Ornitologia 16: 72-75.

Gross, A.O. 1965. The incidence of albinism in North American birds. Bird-Banding 36: 67‑71.

Harris, R.D. 1983. Albinistic Red-breasted Sapsucker. Western Birds 14: 168.

Harrison, C.J.O. 1963. Non-melanic, carotenistic and allied variant plumages in birds. Bulletin of the British Ornithologists' Club 83: 90-96.

Harrison, C.J.O. 1985. Plumage, abnormal, In: Campbell, B. Lack, E. (Eds.). A Dictionary of Birds. Staffordshire, England. pp. 472-474.

Hosner, P.A., Lebbin, D.J. 2006. Observations of plumage pigment aberrations of birds in Ecuador, including Ramphastidae. Boletín de la Sociedad Antioqueña de Ornitología 16: 30-43.

Insfrán, F.R. 1931. Un caso raro de albinismo en la especie *Crotophaga ani* L. Anó moroti. Revista de la Sociedad Científica del Paraguay 31(1): 33.

McGraw, K.J., Nogare, M.C. 2004. Carotenoid pigments and the selectivity of psittacofulvin-based coloration systems in parrots. Comparative Biochemistry and Physiology Part B 138: 229-233.

McGraw, K.J., Nogare M.C. 2005. Distribution of unique red feather pigments in parrots. Biology Letters 1: 38-43.

Møller, A.P., Mousseau, T.A. 2001. Albinism and phenotype of Barn Swallows (*Hirundo rustica*) from Chernobyl. Evolution 55: 2097‑2104.

Nero, R.W. 1954. Plumage aberrations of the redwing *Agelaius phoeniceus*. The Auk 71: 137-155.

Rensch, B. 1925. Die Farberaberration der Vogel. Journal für Ornithologie 73: 514-539.

SACC. 2017. Checklist of the birds of South America. http://www.museum.lsu.edu/~Remsen/SACCBaseline.html. Consulted online January 2017.

Sage, B. L. 1963. The incidence of albinism and melanism in British birds. British Birds 56: 409‑416.

Smith, P. 2016. Striking plumage anomalies in two Tyrannidae (Passeriformes): Vermilion Flycatcher *Pyrocephalus rubinus* and Tropical Pewee *Contopus cinereus* from Paraguay. Ornithologia 9: 27-29.

Stradi, R., Pini, E., Celetano, G. 2001. The chemical structure of the pigments in *Ara macao* plumage. Comparative Biochemistry and Physiology Part B 130: 57-63.

Teixeira, D.M. 1985. Plumagens aberrantes em Psittacidae Neotropicais. Revista Brasileira de Biologia 45: 143-148.

Van Grouw, H. 2006. Not every white bird is an albino: sense and nonsense about colour aberrations in birds. Dutch Birding 28: 79‑89.

Withgott, J.H., McMahon, J.A. 1993. Conspecific harassment of a leucistic Barn Swallow. Bulletin of the Oklahoma Ornithological Society 26: 38‑39.

Zapata, A.R.P., Novatti, R. 1979. Aves albinas en la colección del Museo de la Plata. El Hornero 12: 1-10.