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PLUMAGE

A BLUE SUNBIRD: COLOUR VARIATION AS A POSSIBLE ARID CLIMATE ADAPTATION IN THE MALACHITE SUNBIRD *NECTARINIA FAMOSA*

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On 3 November 2015, while atlasing pentad 2850_1645 between Port Nolloth and Alexander Bay in the Richtersveld, Northern Cape, South Africa, we observed, in a dense succulent thicket, a glossy blue-plumaged bird which we at first thought was a Cape Glossy Starling *Lamprotornis nitens* (Fig. 1). After some observation, we saw that this blue bird was accompanied by a sunbird with dark brown dorsal plumage and a white belly (Fig. 2). The blue bird was then seen to be a sunbird as well. No matter which way it turned, clambering through the dense scrub, no green was observed, only a deep, royal blue (Fig. 1). The blue bird was identified as a male Malachite Sunbird *Nectarinia famosa*, with aberrant plumage, and the second bird as a female of the same species.

This observation started a chain of thought into why the normal bright metallic green plumage had become blue. *N. famosa* males are typically metallic green; however, in the Western Cape they often have some blue plumage on their wings (personal observations). We have not been able to find any reference to *N. famosa* with blue plumage in the literature, and it appears to be assumed that any blue is due to the angle of incident light striking melanin granules in the feathers. For this species there are a number of photographs (via Google search) which

Figure 1. Blue-plumaged Nectarinia famosa *in a succulent thicket. No trace of green plumage was seen, no matter the orientation of the bird.*

show some blue in the plumage, to varying degrees, usually on the lower belly and wings, but also extending up toward the neck. An example of a bird with some apparent blue in the plumage, from Elgin Valley in the Western Cape, can be found within the BirdPix section of the ADU Virtual Museum: http://vmus.adu.org.za/?vm=BirdPix-32524.

Some physical differences have been recorded between *N. famosa* from Western Cape and Eastern Cape, and the Drakensberg, with a significant difference in mean tail length (shorter in the Western Cape;

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de Swardt et al. 2003). The physical differences correlate with altitudinal differences, and thus environmental conditions.

Blue metallic plumage is found in some other members of *Nectarinia*, with the Scarlet-tufted Malachite Sunbird *Nectarinia johnstoni dartmouthi,* from the Virunga and Ruwenzori mountains, the closest in appearance and plumage colours to our Richtersveld example. *N. j. dartmouthi* is described as a long-winged, short-billed race with bluish-green metallic plumage in males and dark brown females (Williams 1951). It is similar in appearance to *N. famosa*.

In an electron microscope study of the iridescent feathers of several sunbirds, Durrer & Villiger (1962) found that the thickness and spacing of melanin plates determined the color of the reflected light, and could account for differences in metallic colours between species. McNaught & Owens (2002) found that interspecific variation in plumage coloration was associated with variation in light environments, with significant associations between patterns of habitat use and interspecific variation in values of both hue and brightness.

Melanin primarily functions to absorb incoherently scattered white light from feather barbs. Melanin density affects the brightness of individual birds (Shawkey & Hill 2006). Changes in distribution of pigments within feathers can cause major changes in colour display (Shawkey et al. 2006a). The iridescence of feathers is due to the ordering of the melanin granules into a dense layer along the edges of barbules of feathers (Shawkey et al. 2006b).

In satin bowerbirds, olive-green juveniles change to blue when moulting into adult plumage, and this is possibly because the olive-green colour is caused by a combination of blue-producing melanin in the barbules and yellow carotenoid pigments in the barb (Doucet et al 2006). The layer of melanin in the barbules is thick and absorbs most of the light reaching it. Melanins absorb a large amount of light, two to three times as much as carotenoids (Sarna & Schwartz, 1998), and release it as heat. The green of a normal Malachite Sunbird is produced by a similar combination of yellow carotenoid pigment in the spongy cortex of the barb and melanin granules. If melanin is more densely packed in the barbules and prevents light from reaching the yellow pigment in the spongy cortex of the barb, the feathers appear blue.

Figure 2. Female Nectarinia famosa*, with very dark dorsal plumage and white underparts.*

Studies by various authors (e.g. Ward et al. 2002; Delhey et al. 2010) have shown that, in addition to ornamental functions, melanins – and especially eumelanins – provide structural support to feathers. Inclusion of melanin granules increases the thickness as well as the hardness of keratin. This results in increased resistance to mechanical damage from wear or activity of microorganisms. In an arid desert climate, such as the Richtersveld, fine airborne dust would tend to damage plumage. Some studies argue that melanin also provides feathers with protection against UV and oxidative stress.

It would be interesting to determine whether this colour variation is present in more individuals in the area, or whether our individual was merely a “sport”. In this regard, it is worth noting that both the male and the female showed variation from the norm.

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