

# PHOENICULUS DAMARENSIS - P. PURPUREUS LATITUDINAL DISTANCE IN MANTLE IRIDOSOME DIAMETERS

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**Abstract.** A latitudinal distance was proposed on microscopic differences in green and violet woodhoopoe mantle iridosomediameters of mantle feathers. Outer iridophore diameters from Green Woodhoopoe *P. p. purpureus* barbules ( $0.22 \pm 0.03 \mu\text{m}$ ,  $n = 244$ ) recorded at Morgan Bay were smaller than those from violet barbules ( $0.28 \pm 0.04 \mu\text{m}$ ,  $n = 248$ ) recorded in Namibia. A latitudinal distance demonstrated a difference of  $0.38^\circ$  equivalent to 2.37 km with an outer diameter difference between violet and green woodhoopoes ( $0.06\mu\text{m}$ ). This study examined woodhoopoes mantles interspecific distances which may show consequences for variation within roosts over 0.93 m.

**Keywords:** distance; latitude, microscopy, woodhoopoe.

## I. INTRODUCTION

There is an ecogeographical rule which states within a species of endotherms, more heavily pigmented forms are found in more humid environments near the equator<sup>[9]</sup>. It was first remarked upon this phenomenon in 1833 in a review of the covariation of climate and avian plumage color. The Namibian Violet Woodhoopoe *P. d. damarensis* is an arid near-endemic with a near-resolved taxonomic status<sup>[2, 3, 5]</sup>. It is closely related to the Green Woodhoopoe *Phoeniculus purpureus* yet differs in mass and mantle feather coloration<sup>[3, 4, 7, 10]</sup>. Here I provide some resolution to the ecogeographical status of the Violet Woodhoopoe *P. damarensis* in comparison with the Green Woodhoopoe *P. purpureus*, using microscopic details of mantle feathers across latitude.

## II. MATERIALS AND METHODS

Mantle feathers were sampled from netted live Violet (Namibia: Hobatere and Omaruru;  $n = 9$ ) and a dead Green Woodhoopoe (Morgan Bay;  $n = 1$ ) in 1999. Mantle feathers were soaked for 30

min. in 0.25M NaOH, followed by 2 hours in formic acid: EtOH (2:3 v/v) and 3 days in 15% (v/v) Spurr's resin in propylene oxide. They were then embedded in Spurr's resin. Both transverse and longitudinal sections of the barbules were cut, revealing that the iridophores of both species were hollow prolate cylinders. Iridophore cylinder widths were measured and correlated with latitudes using the Pearson Correlation Coefficient

Calculator(<http://www.socscistatistics.com/tests/pearson/default2.aspx>). Measurements of the outer iridosome diameter of Green feathers from the Morgan Bay bird were compared with those from a Hobatere bird and an Omaruru bird. The equation for the variation in latitude with outer iridosome diameter was generated ( $y = 0.00475518 \cdot x + 0.37634345$ ). Differences between violet and green iridosome diameters were inserted as well as variations in the outer iridosome diameter of each species were also inserted. Degrees were converted into the distance

at <https://vodoprovod.blogspot.com/2019/01/degrees-to-kilometers.html>.

## III. RESULTS

Mantle feathers and iridophores from Namibian Violet Woodhoopoe *P. damarensis* and Green Woodhoopoe *P. p. purpureus* vary according to (latitude and) distance ( $y = 0.00475518 \cdot x + 0.37634345$ ). Birds identified as *P. d. damarensis* had predominantly violet mantles. The difference between woodhoopoe species is a strong correlation between outer diameter and latitude ( $r=0.9892$ ,  $r^2=0.9785$ ,  $n=6$ ,  $p=0.000174$ ) as well as distance (2.366429798990103 km).

When the outer diameters were compared within species the variation was 0.376486 (0.03) in green and 0.376534 (0.04) in violet; a difference of 0.000148 (0.929911425436m).

#### IV. DISCUSSION

Examination of mantle feathers from woodhoopoes suggests a clinal variation over distances of 2.37 km<sup>[4]</sup>. A simple model of latitudinal gradients-distances cannot account for differences between iridophore diameters, although differences were once thought to be enough to distinguish green from violet woodhoopoes. This study reveals woodhoopoes mantles have consequences for variation as iridosome outer diameters are likely to vary within roosts (over the calculated 0.93m)<sup>[7]</sup>. The results support a complex version of the biological rule<sup>[9, 11]</sup>. This supports the results found in Australasian songbird clades<sup>[8]</sup>. It is also consistent with darker birds being larger than lighter birds<sup>[1, 4]</sup>. A closer examination of rainfall and temperature and a comparison among woodhoopoes from different latitudes helps to support the complex biological rule<sup>[4, 6]</sup>.

#### V. CONCLUSION

Examination of mantle feathers from woodhoopoes suggests a latitudinal variation of the outer iridosome diameters consistent with the complex biological rule over 0.93m distances.

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