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The Colouration in *Dicrurus caerulescens* (White-bellied Drongo) Follows the Precipitation and Temperature of the Environment

Weerakkody S.[1], Goodale E.[2, 3], Gunasekara V.R.[1], O'Brien I.[4], Bond A.[5], Seneviratne S.S.[1]*

[1]Avian Sciences and Conservation, Department of Zoology and Environment Sciences, University of Colombo, Colombo 03, Sri Lanka
[2]Guangxi Key Laboratory of Forest Ecology and Conservation, College of Forestry, Guangxi University, Guangxi, PR China
[3]Department of Health and Environmental Sciences, Xi'an Jiaotong-Liverpool University, Suzhou, China
[4]Field Museum of Natural History, 1400 S Lake Shore Dr, Chicago, United States
[5]The Natural History Museum, Akeman Street, Tring, Hertfordshire, United Kingdom
**sam@sci.cmb.ac.lk*

Abstract

The variation in climatic conditions over space and time is considered a major driving force in speciation. Gloger's rule is one such rule that broadly explains the variation in the colouration of endotherms (birds and mammals) with the effects of climatic parameters. This predicts that endothermic animals tend to have darker colouration in warm and rainy climates. Here we have tried to explain the variation in the belly white colour in *Dicrurus caerulescens* (White-bellied Drongo), an overall black coloured bird with a variable white belly. The dark bellied birds are considered the subspecies *D. c. leucopygialis* found in the wetzone of Sri Lanka, and the pale bellied birds are considered *D. c. caerulescens* (found in the northern India) and *D. c. insularis* (in dryzone of Sri Lanka). A total number of 112 individuals of adult White-bellied Drongo, including field (n=23) and museum samples (n=36) from Sri Lanka (Total 59), and museum samples from India (n=45) and Nepal (n=8) which were deposited at the National Museum of Sri Lanka, Field Museum of Natural History, USA and the Natural History Museum, UK were taken into consideration. The length of the white belly was measured using a dial calliper adopting a standardized method to minimize inconsistencies. To understand how the extent of white belly varied with respect to precipitation and temperature, we adopted generalized least squares (GLS) methods accounting for spatial autocorrelation between data points. The climatic variables were extracted from the world climatic data through QGIS software. The GLS methods were carried out using the "nlme" package in the R Software for different orders of Autoregressive-moving average (ARMA) for the squared value of white belly length. To find the best fitting model, we used the Akaike information criterion (AIC) using the package "AICcmodavg" in the R. From this, we found a negative significant effect of the interaction between the temperature and precipitation for the white belly length over the studied area in ARMA (1, 1) correlation (-3.72e-01±-0.022, t= -2.23, $p<0.05$). The white belly is smaller; hence the birds are darker where there is higher temperature and precipitation. The reverse (pale belly) is true when lower temperatures and/or humidity. Therefore, this follows the Gloger's rule of becoming darker in colouration with the high rainfall and temperature in *D. caerulescens*.

Keywords: *Dicrurus caerulescens,* Colouration, Gloger's rule, Temperature, Precipitation