

Shortnote :

**HOW CLOSE ARE THE RELATIONSHIP BETWEEN FOUR
INDONESIAN SUNBIRDS OF THE GENUS ANTHREPTES ?**

by

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There are 17 species belonging to the genus *Anthreptes* that are so far recorded in the world, and four species of them are found in Indonesia. These species are: *Anthreptes simplex* which is distributed in Sumatra, Nias Island, Kalimantan, and Natuna; *A. malacensis* which has seven races and is distributed in Sumatra, Jawa, Kalimantan and their adjacent islands, Sangir Island, Sulawesi, Sula island, Sumbawa, Flores, Lombok, Pantar, Alor, and Sumba; *A. rhodolaema* which is distributed in Sumatra and Kalimantan; and *A. singalensis* which has six races and is distributed in Sumatra, Belitung, Natuna, Kalimantan, Banggai, and Jawa (MacKinnon, J. & K. Phillips, 1993. A Field Guide to the Birds of Borneo, Sumatra, Java, and Bali: the Greater Sunda Islands. Oxford Univ. Press., Oxford).

Delacour (1940) who examined 16 species of *Anthreptes* suggested three phylogenical groups of *Anthreptes* radiated from *A. gabonicus*. The first group consists of *frasei*, *reichnowi*, and *anchieta*. The second consists of *longuemarei*, *neglecta*, *aurantia*, *pallidigaster*, *rectirostris*, *collaris*, and *platura*. The species included in the third group are those living in Indonesia, i.e. *simplex*, *griseigularis*, *malacensis*, *rhodolaema*, and *singalensis*.

However, Delacour did not present morphological data which could enlighten his findings. This paper presents morphological comparison of these sunbirds in order to come to a better understanding on the relationship between these closely related species.

The measurement was made on 327 skin specimens disposed at the Museum Zoologicum Bogoriense. Species of the genus *Anthreptes* examined in this study were: (1) *Anthreptes malacensis* (abbreviated as mal); (2) *A. rhodolaema* (rho); (3) *A. simplex* (sim); and (4) *A. singalensis* (sin). Another sunbird species of the genus *Hypogramma*,

which is *H. hypogramma* (abbreviated as hyp) was analysed for comparison purposes. Four characters that can be made on skin collections with minimal error are culmen (*chord*) length, wing (*flattened*) length, tail length, and tarsus length.

Univariate analysis was done on all characters to examine differences between taxonomic units, using Oneway Anova and Mann-Whitney test which was computed with MINITAB version 7.1. This would show both variation and differentiation in characters between taxonomic units examined in the study. Cluster analysis was done on the Chord Distance matrix between taxonomic units calculated from the average values of each character for all taxonomic units; and the average values for each character were computed from raw data which were normalized with their mean and standard deviation values. The dissimilarity and cluster analyses were performed using a Multivariate Statistical Package produced by W.L. Kovach (Bloomington University).

Table 1. Mean and Standard Error (in brackets) for each character of each sunbird species examined in this study (** = $p < 0.01$).

Species	mal	rho	sim	sin	hyp
N	121	8	20	46	5
Culmen	14.62 (0.14)	13.75 (0.35)	11.97 (0.28)	12.43 (0.36)	16.29 (0.61)
Wing	61.93 (0.30)	63.20 (1.34)	58.28 (0.79)	56.31 (0.70)	62.41 (1.85)
Tail	40.81 (0.35)	43.39 (2.17)	42.83 (1.06)	40.45 (0.47)	46.40 (3.89)
Tarsus	13.41 (0.14)	12.47 (0.30)	11.18 (0.23)	13.46 (0.21)	12.05 (0.54)

The analysis indicates that difference between species in culmen length are significant, except between *simplex* and *singalensis* (Mann-Whitney Test: $W = 702.5$; $p = 0.65$). Differences between species in wing length are also significant, except between *malacensis* and *hypogramma* ($W = 7678.5$; $p = 0.95$), *malacensis* and *rhodolaema* (W

= 77777.0, $p = 0.39$), and between *hypogramma* and *rhodolaema* ($W = 36.0$; $p = 0.94$). The tarsus length differs too between species, except between *malacensis* and *hypogramma* ($W = 7839.5$; $p = 0.05$), *malacensis* and *singalensis* ($W = 10113.0$; $p = 0.86$), *hypogramma* and *rhodolaema* ($W = 33.0$; $p = 0.83$), and *hypogramma* and *simplex* ($W = 85.5$; $p = 0.17$). On the other hand, there is no significant difference in the tail length between species (Table 1).

When analysed further using Cluster and Principal Component Analyses, it is revealed that *rhodolaema*, *singalensis*, and *malacensis* are within a group. This group is then clustered with *simplex*, but the similarity between them is very small. And, *hypogramma* is placed further from the others (Figure 1 and 2).

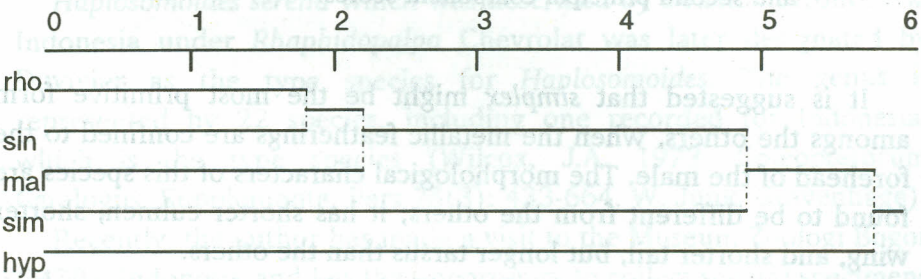


Figure 1. Dendrogram showing the grouping of taxonomic units based on Euclidean distances between them (Cophenetic correlation = $r^2 = 0.899$; $F = 80.88$, $p < 0.01$).

Plumage colouration in examining all members of *Anthreptes*. He grouped all Indonesian *Anthreptes* into Indo-Malayan species whose males have metallic plumage but females have none at all (Delacour, J. 1944. A revision of the family Nectariniidae (sunbirds). (Zoologica (New York) 29: 17-38). The metallic featherings are less elaborated in *simplex* than in the others. No morphological measurements supported his examination. The results in this study present further supports for his grouping, where *singalensis*, whereas *simplex* is distinctive from the others.

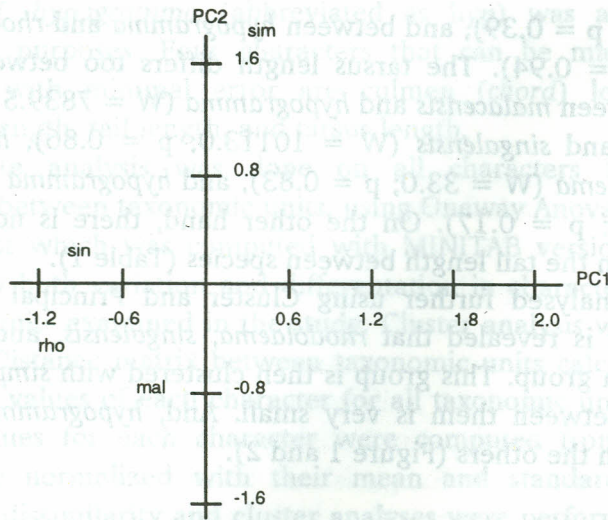


Figure 2. Geometrical space of each *Anthreptes* species based on their first and second principal component scores.

It is suggested that *simplex* might be the most primitive form amongs the others, when the metallic featherings are confined to the forehead of the male. The morphological characters of this species are found to be different from the others; it has shorter culmen, shorter wing, and shorter tail, but longer tarsus than the others.

Since all species, but at subspecific level, are almost sympatric, it might be interesting to investigate the modes of speciation amongst this group. And, this remain open for futher studies.