

A reassessment of the subspecies in the Ruwenzori Turaco *Ruwenzorornis johnstoni*

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The Ruwenzori Turaco is an Afrotropical montane forest resident, limited in distribution to mountains of the Albertine Rift in the eastern Democratic Republic of Congo and western Rwanda, western Burundi and western Uganda. The relationship of this bird within the Musophagidae is in dispute and indeed, *Ruwenzorornis* is not universally used; *The birds of Africa* (Fry et al. 1988, hereafter referred to as *BoA*) placed this species in *Musophaga*. We accept *Ruwenzorornis pro tempore*, following *Handbook of the birds of the world* (del Hoyo et al. 1997, hereafter referred to as *HBW*).

Three subspecies have been described:

1. nominate *johnstoni* Sharpe 1901 from Mt. Ruwenzori and its immediate surroundings in Democratic Republic of Congo and Uganda,
2. *kivuensis* Neumann 1908 from the other mountains in Kivu province, Democratic Republic of Congo (Virungas—Mt. Kahuzi area and in Itombwe), from Rwanda and from Burundi—*fide* J. M. Lernoould (and presumably from extreme south-western Uganda),
3. *bredoi* Verheyen 1947 from Mt. Kabobo (extreme northern Katanga province, Democratic Republic of Congo).

Only the first two have been retained by *BoA*, which merges *bredoi* in *kivuensis*. This is probably a *lapsus calami*, because *bredoi* has usually been synonymized with the nominate race (as in *HBW*). In fact, the only difference generally accepted is that *kivuensis* lacks the bare facial patch present in the (two) other race(s), having this area fully feathered. Verheyen (1947) suggested other characteristics for *bredoi*: shorter crest, smaller bill, general plumage colour more violet and a typically larger red breast spot.

Based on examination of specimens in the Koninklijk Museum voor Midden-Afrika, Tervuren (KMMA) and the Koninklijk Belgisch Instituut voor Natuurwetenschappen (KBIN), we document morphological differences between five populations of the Ruwenzori Turaco, and discuss their taxonomy.

Material and methods

A total of 136 specimens was studied; 99 were measured. Samples included five discrete populations, each restricted to isolated mountains: *johnstoni* (Mt. Ruwenzori area), *bredoi* (Mt. Kabobo), *kivuensis* (Itombwe), *kivuensis* (Northern Kivu, in the Virunga—Mt. Kahuzi area and northern Rwanda), *kivuensis* (Nyungwe forest in Rwanda) Fig. 1.

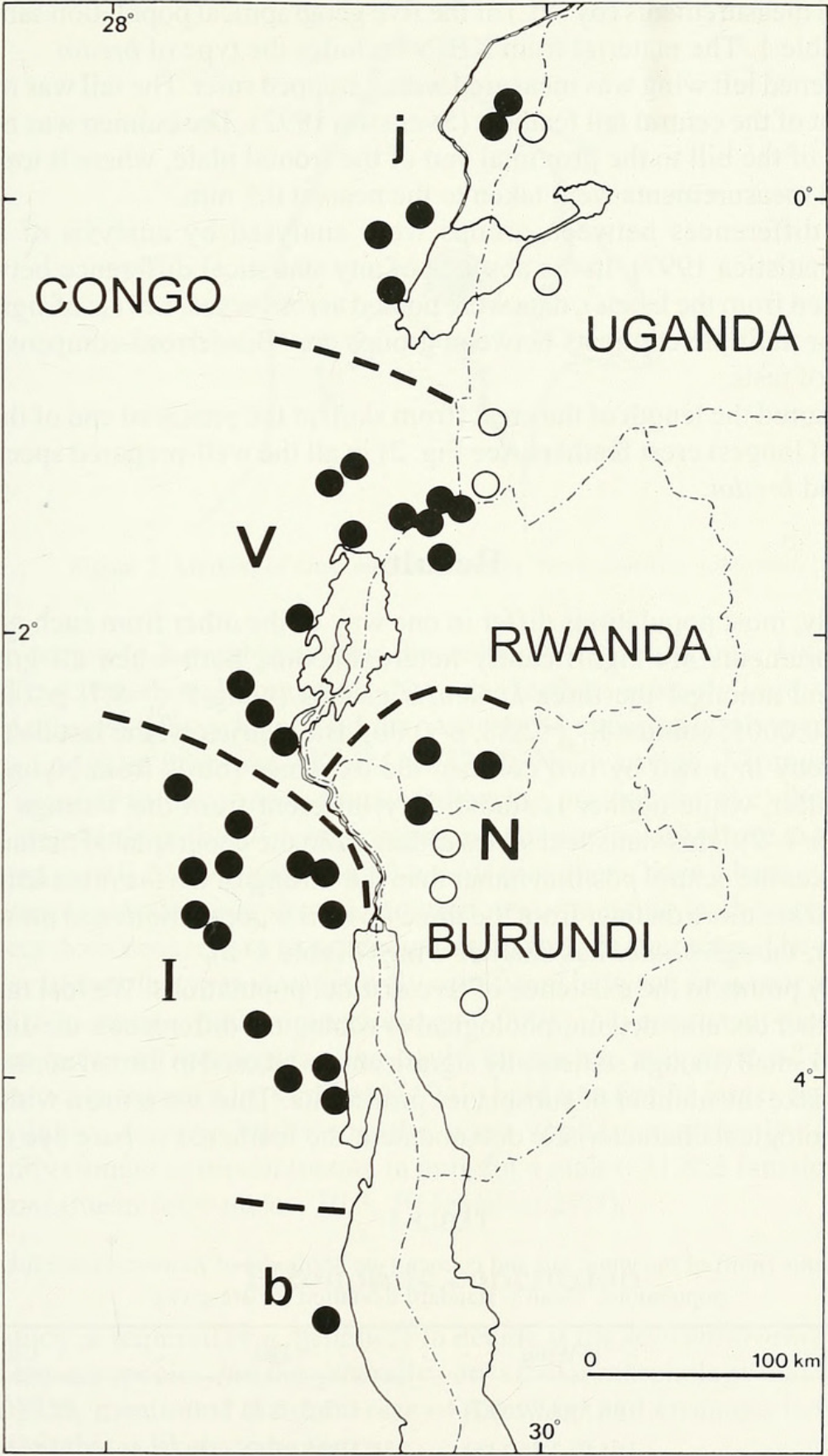


Figure 1. Localities of specimens examined and the delimitation of the five geographical populations studied (filled circles); *j*: *johnstoni*, *b*: *bredoi*, V: Virunga area, N: Nyungwe, I: Itombwe. In order to complete the world range of the species, the records from Burundi (Gaugris 1976) and Uganda (Short et al. 1990; Francis & Penford 1993) are added as open circles.

Standard measurements (by ML) of the five geographical population samples are shown in Table 1. The material from KBIN includes the type of *bredoi*.

The flattened left wing was measured with a stopped ruler. The tail was measured from the root of the central tail feathers (Svensson 1992). The culmen was measured from the tip of the bill to the proximal end of the frontal plate, where it touches the feathers. All measurements were taken to the nearest 0.5 mm.

Overall differences between groups were analysed by analysis of variance (ANOVA, Statistica 1997). In the absence of any statistical difference between the sexes (as taken from the labels), data were pooled across sexes. Levels of significance presented for multiple contrasts between groups are ‘Bonferroni-compensated’ for the number of tests.

AR measured the length of the crest (from skull at the proximal end of the frontal plate to tip of longest crest feathers, see Fig. 2) in all the well-prepared specimens of *johnstoni* and *bredoi*.

Results

Biometrically, most populations differ in one way or the other from each other. The three measurements are significantly heterogeneous, both when all groups are compared and amongst the three *kivuensis* groups (wing $F_{2,51}=8.7$, $p<0.001$; tail $F_{2,55}=9.3$, $p<0.0005$; culmen $F_{2,59}=2.88$, $p=0.06$). Biometrically, the last three form a series, whereby in a two by two contrast the extremes (birds from Nyungwe and Itombwe) differ, while neither is statistically different from the Virunga (central) group (Tables 1–2). This statistical series differs from the geographical picture, where Nyungwe takes the central position rather than the Virungas. On the other hand *bredoi* and *johnstoni* are more distinct from the three *kivuensis* populations and more similar to each other, though *bredoi* has smaller wings (Table 1–2).

Our study points to the existence of five distinct populations. We feel that, in the absence of other documented morphological or ecological differences, the differences in size are too small (though statistically significant) to be used in formal nomenclature, and would make the number of subspecies proliferate. Thus we remain with the sole other morphological characteristic documented: the feathered or bare eye rim. This

TABLE 1
Measurements (mm) of the wing, tail and culmen (see Methods) of *Ruwenzorornis johnstoni* populations. Mean ± standard deviation (n) are given

	Wing	Tail	Culmen
<i>johnstoni</i>	166.5±3.79 (17)	182.1±3.75 (16)	31.1±1.32 (17)
<i>bredoi</i>	161.9±2.76 (16)	180.8±5.66 (16)	30.5±1.36 (19)
<i>kivuensis</i> (Nyungwe)	170.4±4.39 (14)	190.8±4.05 (19)	33.0±0.94 (22)
<i>kivuensis</i> (Virungas)	167.7±3.38 (24)	187.3±4.78 (24)	32.8±1.42 (24)
<i>kivuensis</i> (Itombwe)	164.6±3.90 (16)	183.4±6.04 (15)	33.7±0.98 (16)

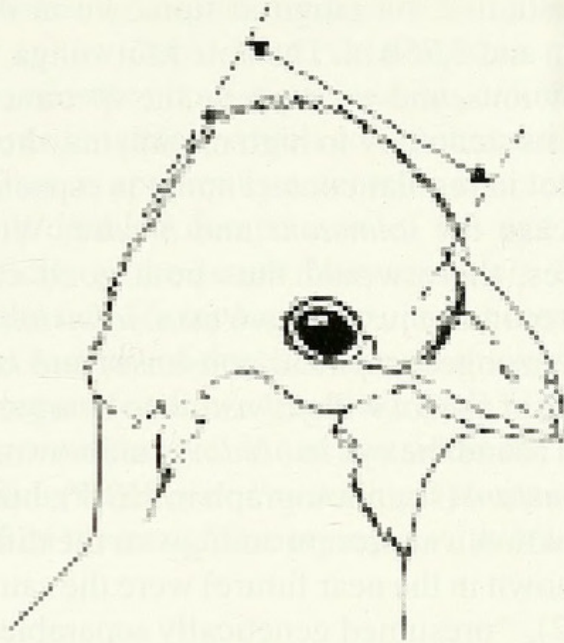


Figure 2. Method of crest measurement in *Ruwenzorornis johnstoni*.

character seems to be stable within the respective populations; *kivuensis* has a feathered eye rim, though immatures have the feathers sparsely implanted, shorter and decidedly less glossy than in adults. Among 84 apparent adult specimens, only two (Lac Lungwe, Itombwe—KMMA 58327; Nyawaronga, Virunga—KMMA 100929) seemed to have more sparse feathering around the eye: these localities however are plainly in the *kivuensis* range, and not particularly close to the *johnstoni* (*bredoi*) range. All 22 *johnstoni* and 19 *bredoi* specimens have a bare eye rim, while the well prepared specimens show a very thin rim of metallic feathers below the bare patch; there does not seem to exist real variation for this character. The difference in occurrence of eye rim types is statistically significant between *kivuensis* and *johnstoni* or *bredoi* (Chi-square; both comparisons $p < 0.0001$). No consistent plumage colour difference between the populations could be found, and none of the plumage characteristics mentioned by Verheyen (1947) hold true for the larger series of *bredoi* now available. *Contra* Verheyen, the crest appears marginally (though not significantly) longer in *bredoi* (mean, in mm, for 4 males: 31.8; 2 females: 30.1) than in *johnstoni* (mean for 4 males: 30.3; 10 females: 29.7).

Taxonomic conclusion

Further study is required (e.g. genetics) to decide if the *Ruwenzorornis* populations indeed form one species, but the generally very similar morphology and vocalisations (Chapin 1939, mentioned that the voice of *johnstoni* and *kivuensis* is very similar) indicate that this is likely to be the case.

Zoogeographically inconsistent is the fact that the “bare patch” populations; *johnstoni* to the north and *bredoi* to the south, are separated by the “feathered” population. The altitudinal range of all the populations is similar: this bird generally occurs above *c.* 2,000 m (*HBW*), at times descending down to “6,500 feet” (Chapin

1939). Prigogine (1978) studied the range in Itombwe in detail and found that it occurred between 1,770 m and 2,750 m. The note Mutwanga “1,200 m” on the label of KMMA 71995 is suspicious, and we suppose the specimen was collected in fact above the village. Due to its stenotopy to high mountains, the subpopulations of this bird are, without doubt, not in regular contact and it is especially highly improbable that this would be the case for *johnstoni* and *bredoi*. With only the described morphological differences, there would thus be a good case, in order to avoid unnecessary splitting, to recognise just the two taxa: *johnstoni* (including *bredoi* as a synonym, although this is zoogeographical nonsense) and *kivuensis*. However, we consider the synonymizing of *bredoi* with *johnstoni* to be a premature action, because the colour of the bare skin round the eye in *bredoi* is unknown. It is yellowish distally and red proximally in *johnstoni* (see photograph in *HBW*), but it would be surprising if this colour (which is unknown at present and, given the difficulty of access of Mt. Kabobo, unlikely to be known in the near future) were the same in *bredoi*. According to Amadon & Short (1992), “presumed genetically separable” is a criterion that can be used to recognise subspecies and we concur in the present case. Therefore, we advocate the use of 3 subspecies in *Ruwenzorornis johnstoni*: nominate, *bredoi* and *kivuensis*.

TABLE 2
Statistical comparisons between populations of *Ruwenzorornis johnstoni*

	Nyungwe	<i>kivuensis</i> Virungas	Itombwe	<i>johnstoni</i>	<i>bredoi</i>
A. Wing ($F_{4,82}=12.1,***$)					
<i>kivuensis</i>					
Nyungwe	—	NS	**	*	***
Virungas		—	NS	NS	***
Itombwe			—	NS	NS
<i>johnstoni</i>				—	*
B. Tail ($F_{4,85}=12.6,***$)					
<i>kivuensis</i>					
Nyungwe	—	NS	**	***	***
Virungas		—	NS	*	**
Itombwe			—	NS	NS
<i>johnstoni</i>				—	NS
C. Culmen ($F_{4,93}=21.9,***$)					
<i>kivuensis</i>					
Nyungwe	—	NS	NS	***	***
Virungas		—	NS	**	***
Itombwe			—	***	***
<i>johnstoni</i>				—	NS

(Bonferroni-compensated ANOVA contrasts: NS, not significant; * $p<0.05$, ** $p<0.001$, *** $p<0.0001$)

In turacos, the advertising colours are highly variable (at species level). In the unrelated *Pica pica* (Corvidae), bare skin around the eye occurs in some geographically widely separate populations, and it is coloured differently (Lawton & Lawton 1986). This bare skin patch, which does not occur in the core population but is present in small isolates, is apparently a neotenic characteristic both in *Pica* and in *Ruwenzorornis*. Also, a detailed comparison of the eye patch may give a useful indication as to the validity of the genus *Ruwenzorornis*. Bare skin round the eye is present in the adult of the two *Musophaga* spp., and at most as a thin rim in the adult of the ten *Tauraco* spp. A study of the bare skin in the juvenile may be revealing in this context; the sole report for *Ruwenzorornis* (*vide* HBW) describes the juvenile with bare (blue) skin around the eye. If one considers the feathered condition in the adult as ancestral in *Ruwenzorornis*, “reverting” to a neotenic condition in small isolated populations, then the case for merging it with *Musophaga*, as advocated by BoA, is poor.

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