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The taxonomic status of Crimson-crested Turaco *Menelikornis (leucotis) donaldsoni*

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SUMMARY.—White-cheeked Turaco *Menelikornis (leucotis) leucotis* and Crimson-crested Turaco *M. (l.) donaldsoni* have long been treated as conspecific. Because of the lack of data concerning their distribution and areas of potential geographical overlap, they have been considered to be parapatric at most. In 2019 and 2021, we conducted a field study that produced nearly 40 records of the two taxa. In the study area, which stretched 120 km north to south from the upper Shabelle Valley via the Oda and Bale Mts. to Hareenna Forest, both *leucotis* and *donaldsoni* occurred. The presence of both taxa was recorded across c.50 km west to east, which indicates an area of range overlap of about 6,000 km². Sympatry between *leucotis* and *donaldsoni*, together with clear differences in morphology (mainly crest colour) as well as molecular evidence, strongly support treating them as different species.

Originally three turaco species were described from the Horn of Africa. Rüppell (1835) gave the widespread White-cheeked Turaco the scientific name *Corythaix leucotis*. Six decades later, Sharpe (1895) described *Turacus donaldsoni*, for which the vernacular name Crimson-crested Turaco is suggested (see below). Finally, the description of Ruspoli's Turaco by Salvadori (1896) followed, as *Turacus ruspolii*. Subsequent taxonomic revisions relegated *donaldsoni* to a subspecies of White-cheeked Turaco and until recently the following classification has been in widespread use: *Tauraco l. leucotis*, *T. l. donaldsoni* and *T. ruspolii*. However, a recent study by Perktas et al. (2020) revealed that *donaldsoni* is as divergent genetically from *leucotis* as *ruspolii* is, and proposed that all three be treated at species level. Furthermore, the same authors demonstrated that all turacos in the Horn of Africa do not belong to the genus *Tauraco*. Rather, they form a well-separated grouping, for which the genus-group name *Menelikornis* was introduced by Boetticher (1947, 1955). Whereas the generic classification has since been adopted in the IOC world bird list (Gill et al. 2021), specific status for *donaldsoni* has not. The following aspects were probably decisive: (a) the ranges of *leucotis* and *donaldsoni* were assumed not to overlap, and (b) differences in plumage coloration between *leucotis* and *donaldsoni* were considered minor and functionally insignificant. Here, we provide arguments to counter these assumptions and support specific status for *M. donaldsoni*.

Study area and Methods

Whilst *leucotis* is widespread in Ethiopia, as well as in parts of Eritrea and South Sudan, the range of *donaldsoni* is limited to a relatively small area of Ethiopia east of the Rift Valley, from the highlands around Harar, across the Chercher Mts. to the Arsi and Bale ranges. According to Ash & Atkins (2009), *donaldsoni* occurs alongside *leucotis* in the Bale Mts. Other authors have questioned this and called for clarification as to whether the two occur in sympatry or are parapatric in this region (Turner & Boesman 2020). KG & TT therefore visited the area briefly in May 2019 and KG again on 5–12 May 2021 for a targeted search and survey. Of a total of 38 georeferenced turaco records, 18 involve our own observations

and 18 result from interviews with local residents. We used additional data, dating back to 2007, provided by V. Sthamer and L. Reissland. Local people were familiar with both turacos (which they call 'Sokurru') and could clearly identify the main difference between them (bluish vs. reddish crests). In Harenna Forest a man named Ahmed Aman asked us even before we interviewed him if we knew that there were two turacos with different crest colours. Abdulkadir Mohammed, a local bird guide who lives in a small coffee-farming village in southern Harenna Forest, was also familiar with both taxa and confirmed their occurrence in the vicinity of his settlement.

Voice playback, with recordings of *leucotis* taken from www.xeno-canto.org, was used to track down turacos, which are often silent and inconspicuous, except in the breeding season and during territorial disputes. For data collection in the field, we used the Android mapping app MultibaseCS after we had integrated the bird species list for Ethiopia. Furthermore, photographs and sound-recordings were made.

Results

In the study area, which encompasses large parts of the hitherto known range of *donaldsoni*, stretches c.120 km north to south from the upper Shabelle Valley via the Oda and Bale Mts. to Harenna Forest, both *leucotis* and *donaldsoni* were found. There is c.50 km between the western- and easternmost points of mixed occurrences, which results in an area of approximately 6,000 km² of range overlap (Fig. 1). The data on which Fig. 1 is based are compiled in Table 1.

We thus confirm, as reported by Ash & Atkins (2009), sympatry of *leucotis* and *donaldsoni*. Within the region of overlap, the relative frequency of the two taxa varies. In the Oda Mts. local residents reported that *donaldsoni* is much more common. On the north slope of the Bale Massif (Dinsho, Goba), the relationship is reversed and *leucotis* is dominant (pers. obs.). This also applies to Harenna Forest further south, where *leucotis* is clearly in the majority and *donaldsoni* is considered rare (pers. obs.). It is impossible to make any inferences regarding seasonal variation in their occurrence as the data are inadequate. Such variation was sometimes affirmed by respondents but without any indication of timings.

Our records involved 79 individuals at 18 locations, with 1–15 birds per observation. The max. figure refers to a large group of *donaldsoni* seen on 7 June 2021 near Agarfa (07°17'N, 39°46'E). The birds' reaction to playback songs was often not very pronounced. It was strongest in apparently territorial breeding pairs (*leucotis* in May 2021 near Dinsho) and very weak in foraging groups. Additionally, we managed to collect only a few poor-quality sound-recordings of *leucotis* and *donaldsoni* in the field, but preliminary analyses revealed no clear differences between them in song structure, frequency range and peak frequency.

We have always encountered *leucotis* and *donaldsoni* separately, never in mixed flocks. However, a single *donaldsoni* was observed with several *leucotis* at Rira (06°46'N, 39°43'E) around 2007 (V. Sthamer *in litt.* 2021). To our knowledge, this is the only observation of a mixed group to date. Among the birds we observed there was no evidence of hybrids between *leucotis* and *donaldsoni*. Instead, the coloration of the crest and hindcrown was either dark blue (*leucotis*) or crimson (*donaldsoni*), with no intermediate tones discernible. The colour really becomes obvious when the crown feathers are raised, expressing arousal during courtship or when encountering conspecifics, competitors or predators (Fig. 2).

We found no evidence of elevational segregation between *leucotis* and *donaldsoni*. Difference between the mean elevations of the records was insignificant: 2,470 m ($n = 33$) for *leucotis* + both, and 2,599 m ($n = 22$) for *donaldsoni* + both.

Although we have not studied habitat use and availability, 'Oda' means 'tree' in the Oromia language, which suggests that the Oda Mts. between the Shabelle River and

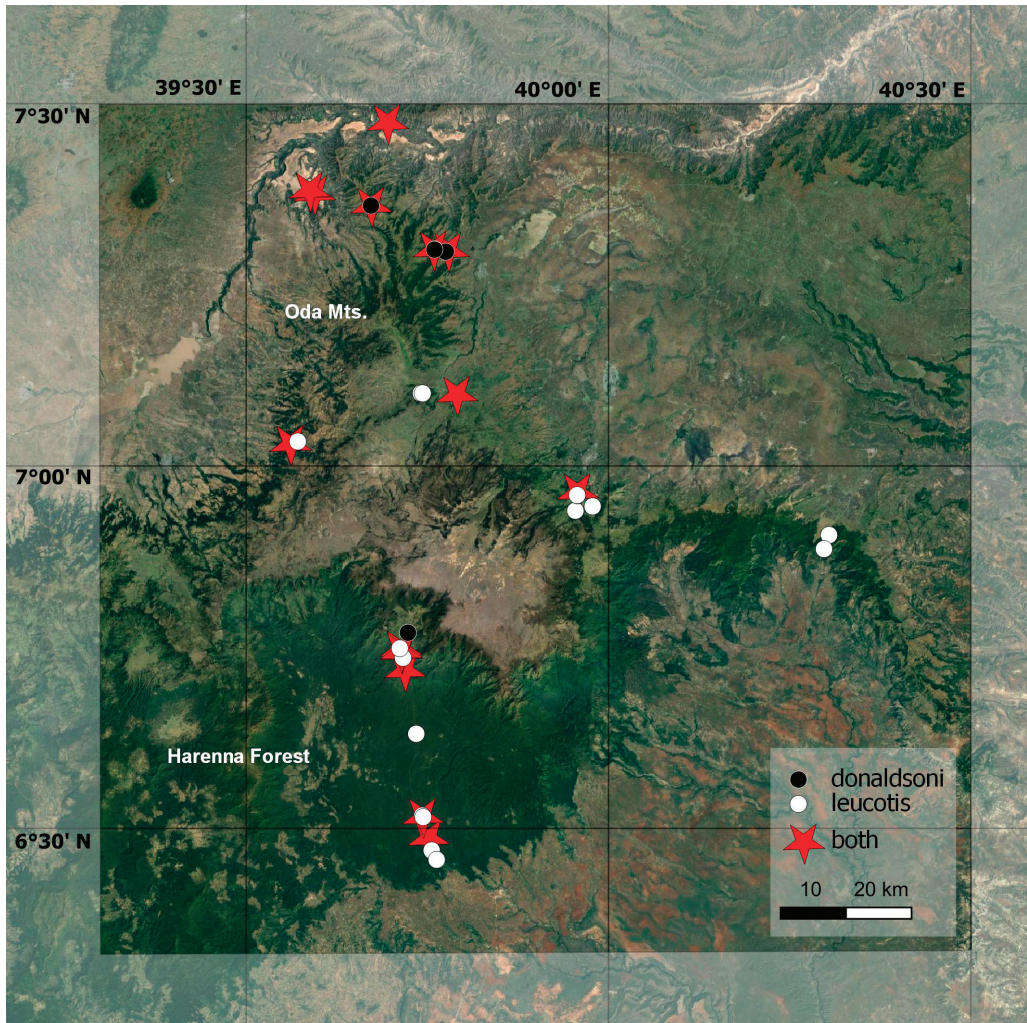


Figure 1. Sightings of White-cheeked Turaco *Menelikornis (l.) leucotis* (white dots) and Crimson-crested Turaco *M. (l.) donaldsoni* (black dots) plus interview data indicating the sympatric occurrence of both taxa (red stars). Map data © 2022 Google Image Landsat / Copernicus.

TABLE 1
Records of White-cheeked Turaco *Menelikornis (l.) leucotis* and Crimson-crested Turaco *Menelikornis (l.) donaldsoni* shown in Fig. 1.

| Latitude (N) | Longitude (E) | Elevation (m) | Date | N | Taxon | Evidence |
|-----------------|-----------------|---------------|--------------|----|-------------------|--|
| 6.7699297176746 | 39.723237513584 | 2,910 | around 2007 | | <i>donaldsoni</i> | observation/photo (V. Sthamer) |
| 7.0984789122541 | 39.790952152770 | 3,185 | 2016 to 2019 | | both | observation/photo (L. Reissland) |
| 7.2988629606828 | 39.760203867479 | 2,865 | 2019-06-05 | 10 | <i>donaldsoni</i> | observation/photo (K. Gedeon, T. Töpfer) |
| 6.8854051265850 | 40.297288932422 | 1,949 | 2019-06-06 | 1 | <i>leucotis</i> | observation/photo (K. Gedeon, T. Töpfer) |
| 6.9046514109856 | 40.304320943745 | 2,191 | 2019-06-06 | 1 | <i>leucotis</i> | observation/photo (K. Gedeon, T. Töpfer) |



| Latitude (N) | Longitude (E) | Elevation (m) | Date | N | Taxon | Evidence |
|-----------------|-----------------|---------------|------------|----|-------------------|------------------------------------|
| 7.0337287848270 | 39.571249959497 | 3,092 | 2019-06-07 | 3 | <i>leucotis</i> | observation (K. Gedeon, T. Töpfer) |
| 7.0301834593247 | 39.560589004343 | 3,009 | 2021-05-05 | | both | interview |
| 7.0304943647706 | 39.561480523475 | 3,025 | 2021-05-05 | | both | interview |
| 7.1002262791555 | 39.743563733750 | 3,342 | 2021-05-05 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 7.1003093366091 | 39.741162401828 | 3,385 | 2021-05-05 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 7.3756705341148 | 39.594406780122 | 1,816 | 2021-05-06 | | both | interview |
| 7.3798223044781 | 39.587639115193 | 1,888 | 2021-05-06 | | both | interview |
| 7.3800150687178 | 39.587779197251 | 1,887 | 2021-05-06 | | both | interview |
| 7.2972309309993 | 39.779082708336 | 2,494 | 2021-05-07 | | both | interview |
| 7.2987813580998 | 39.758805556785 | 2,869 | 2021-05-07 | | both | interview |
| 7.3591491063651 | 39.672704651534 | 2,630 | 2021-05-07 | | both | interview |
| 7.2956124485752 | 39.775503633050 | 2,502 | 2021-05-07 | 15 | <i>donaldsoni</i> | observation/photo (K. Gedeon) |
| 7.2984594610874 | 39.759860407339 | 2,873 | 2021-05-07 | 4 | <i>donaldsoni</i> | observation (K. Gedeon) |
| 7.3592408654477 | 39.672320175977 | 2,623 | 2021-05-07 | 2 | <i>donaldsoni</i> | observation (K. Gedeon) |
| 7.4735849270036 | 39.695373025469 | 1,347 | 2021-05-08 | | both | interview |
| 6.9644006697126 | 39.957567138117 | 2,903 | 2021-05-09 | | both | interview |
| 6.9382543563415 | 39.954314571511 | 3,110 | 2021-05-09 | 10 | <i>leucotis</i> | observation/photo (K. Gedeon) |
| 6.9442566439068 | 39.978048212527 | 2,886 | 2021-05-09 | | <i>leucotis</i> | interview |
| 6.9593083523913 | 39.957219114141 | 2,923 | 2021-05-09 | 3 | <i>leucotis</i> | observation/photo (K. Gedeon) |
| 6.9597258407467 | 39.956727254740 | 2,912 | 2021-05-09 | | <i>leucotis</i> | interview |
| 6.7181055954270 | 39.719161975448 | 2,404 | 2021-05-10 | | both | interview |
| 6.7430674839273 | 39.714478706572 | 2,614 | 2021-05-10 | | both | interview |
| 6.7442734477786 | 39.713977412940 | 2,646 | 2021-05-10 | | both | interview |
| 6.7477608813852 | 39.713893465439 | 2,697 | 2021-05-10 | | both | interview |
| 6.6303994026424 | 39.734725360801 | 1,908 | 2021-05-10 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 6.7352406002204 | 39.716453698275 | 2,531 | 2021-05-10 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 6.7483612266917 | 39.712006697110 | 2,695 | 2021-05-10 | 10 | <i>leucotis</i> | observation/photo (K. Gedeon) |
| 6.4868499980498 | 39.751725480009 | 1,522 | 2021-05-11 | | both | interview |
| 6.5162557129316 | 39.74403912776 | 1,593 | 2021-05-11 | | both | interview |
| 6.4566760675781 | 39.762922598349 | 3,185 | 2021-05-11 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 6.4695006147420 | 39.756040564729 | 1,514 | 2021-05-11 | 1 | <i>leucotis</i> | observation (K. Gedeon) |
| 6.5155892012762 | 39.744204646206 | 1,589 | 2021-05-11 | 12 | <i>leucotis</i> | observation (K. Gedeon) |
| 6.5175619432173 | 39.743066667102 | 1,604 | 2021-05-11 | 2 | <i>leucotis</i> | observation/photo (K. Gedeon) |

Bale Mts. were once well forested. These forests have now disappeared, other than a few remnants. Only in these small, often very sparse patches was *donaldsoni* found. Older farmers repeatedly noted that turacos were common until 20–30 years ago but have since disappeared in many places due to tree clearance. Outside mountain ranges, locals also reported observations of *donaldsoni* in riverine woodland along the Shabelle and its tributaries.

Discussion

Parapatric vs. sympatric distribution.—In his comprehensive review of the Musophagidae, Moreau (1958) lamented that the ranges of *leucotis* and *donaldsoni* had been seriously misrepresented by previous authors, e.g. Friedmann (1930). For the first time, Moreau provided a detailed map with all records available until then and identified a gap of c.80 km (50 miles) between their assumed ranges. However, he cautiously remarked ‘as the intervening country seems to be zoologically unexplored and not unsuitable for the species it is open to speculation whether the black-crested birds and the red-crested meet or intergrade’. Erard & Prévost (1971) emphasised that ‘information from the zone of contact between the two subspecies is still poor, with precise data...lacking’. Brosset & Fry (1988) ignored these considerations and noted that *donaldsoni* is parapatric with *leucotis*. It was not until Ash & Atkins (2009) pointed out that in the Bale Mts. *donaldsoni* ‘is found alongside nominate *leucotis* supporting the view for its specific separation’. Unfortunately, they gave no further details, prompting del Hoyo & Collar (2014) to observe that ‘clarification is necessary as to whether the two co-occur or are parapatric in Bale Mts.’. In the absence of further data, parapatry was still assumed, most recently by Perктаş *et al.* (2020). However, our findings show that the ranges of *leucotis* and *donaldsoni* overlap to a considerable extent. Presumably the area of sympatry is even larger than 6,000 km², as the north-west part of the Bale Mts. (south of Adaba) could not be visited for security reasons, and only a short visit was possible in the north-east (south of Meliyu). In these areas, sympatry of *leucotis* and *donaldsoni* is also quite possible, and further research is clearly necessary. In the area we surveyed and based on the data available, there is no evidence of elevational parapatry (see Table 1).

Turacos are generally sedentary except occasional longer forays in search of food (Turner 1997). The max. distance of such movements in *ruspolii* is reported to be a few kilometres (Borghesio 1997). Therefore, co-occurrence of *leucotis* and *donaldsoni* across 120 km or more is unlikely to be attributable to seasonal movements. Another argument in favour of a zone of co-occurrence, instead of a hybrid zone, is that there is no evidence to date of hybridisation between *leucotis* and *donaldsoni*. This may not be surprising, for although the Bale Mts. are regularly visited by birdwatchers, hybrids would certainly be difficult to identify: differences would mainly be expected in crest colour, ranging between crimson and dark blue, and doubtless a challenge to see in the field. In contrast, hybrids between *leucotis* and *ruspolii* have been repeatedly identified and a high, and possibly increasing, degree of hybridisation has been assumed (Lernould & Seitre 2002, Borghesio *et al.* 2004a,b). Hybrids between *leucotis* and *donaldsoni* are therefore to be expected. Nonetheless, sympatry of *leucotis* and *donaldsoni* presented here, together with the clear differentiation in molecular characteristics (F_{st} 0.67; Perктаş *et al.* 2020), strongly support the view that they should be treated as species.

Morphological and ecological differentiation.—As shown in Fig. 2, the colour of the erect crest in *donaldsoni* is very conspicuous and differs significantly from the dark blue of *leucotis* (Fig. 4). When relaxed, this difference is much less conspicuous and therefore often under-estimated (Fig. 3). This applies to observations in the field, but even more so in museum collections. It is therefore unsurprising that handbooks and field guides depict the differences between *leucotis* and *donaldsoni* as marginal (e.g. Fry *et al.* 1988, del Hoyo *et al.* 1997, Redman *et al.* 2011). Displaying otherwise concealed plumage features apparently plays an important role in turacos, both in threat gestures (Turner 1997: 488, photo) and courtship (bowing and nodding, thereby revealing the crown; Peat 2017). It is known that birds use plumage and vocal characters to advertise their reproductive compatibility,



Figure 2. Crimson-crested Turaco *Menelikornis (l.) donaldsoni*, near Agarfa, June 2019; a bird obviously in a state of intense arousal with the bright crimson crest very striking (Kai Gedeon)



Figure 3. Crimson-crested Turaco *Menelikornis (l.) donaldsoni*, near Agarfa, May 2021; usually the crest coloration is less conspicuous when it is only slightly erected or not at all, as here (Kai Gedeon)



Figure 4. White-cheeked Turaco *Menelikornis (l.) leucotis*, Wondo Genet, east slope of the Rift Valley; note differences in size of white cheek patches and mantle colour compared to *donaldsoni* in Fig. 2 (© Torsten Pröhl)

but there are no published studies of this in *leucotis*. Our own sound-recordings are unfortunately unsuitable for proper analysis. However, it may be worthwhile to explore possible differences in the vocal structure when high-quality recordings from the contact zone become available.

Lernould & Seitre (2004) suggested that reproductive isolation between sympatric Musophaginae species is achieved by ecological barriers rather than via genetic or behavioural ones, because they possess similar social behaviours and easily hybridise in captivity. On the other hand, there are reports of aggressive behaviour between species as closely related as *leucotis* and *ruspolii* where they meet in the wild (Brosset & Fry 1988), and in this context plumage colour differences may play a more important role than suspected by Lernould & Seitre (2004). Whilst habitat differences have been reported in these species (Daka 2011), such studies are lacking for *leucotis* and *donaldsoni*. Although the latter occurs in relatively open habitats in the east of its range around Sheik Husein, it also inhabits densely wooded areas, such as Din-Din (pers. obs.). Erlanger (1905), who travelled around Harar and areas south-west of there prior to extensive forest clearance, described *donaldsoni* as resident in primeval forest with ‘almost impenetrable undergrowth’ and ‘ancient giant trees’. This description also matches Harena Forest today where *leucotis* dominates. We suggest that possible differences in habitat preferences between *leucotis*, *donaldsoni* and



Figure 5. Ruspoli's Turaco *Menelikornis ruspolii*, near Negele, south-east Ethiopia (© Torsten Pröhl)



Figure 6. Left White-cheeked Turaco *Menelikornis (l.) leucotis* at Yergalem, south of Awasa, and right Crimson-crested Turaco *M. (l.) donaldsoni* at Goro Gutu, west of Harar; here only minor differences in the size of the cheek patches and peri-ocular wattles are apparent (© Volker Sthamer)

ruspolii be subject to detailed investigation and that the role of other reproductive barriers, such as plumage colour and behaviour, should not be excluded as alternative explanations.

Erard & Prévost (1971) pointed out that *leucotis* populations (including *donaldsoni*) from different areas of Ethiopia differ in some colour characteristics. They summarised their study of specimens as follows: 'The material from Eritrea, Begember-Gojjam, Shoa, Kaffa and the Sudan has the mantle and wing-coverts blue in colour, with large conspicuous white patches on the sides of the neck, whereas that from Sidamo and Arussi is correspondingly green rather than blue, with the neck-patches smaller.' It is important to note that Sidamo and Arussi form part of the zone where *leucotis* and *donaldsoni* overlap. These colour differences within *leucotis* also may be relevant for separating *donaldsoni*. There are discernible differences between the individuals in Figs. 2–3 (*donaldsoni*) and Fig. 4 (*leucotis*) in mantle colour and cheek patch size. A well-developed peri-ocular wattle is also visible in *donaldsoni*, which is less conspicuous in *leucotis* and in *M. ruspolii* (Fig. 5). However, we cannot assess if this character is potentially related to different excitement levels in the birds. Fig. 6 shows that the differences between *leucotis* and *donaldsoni* can be much less noticeable (other than crest coloration). Further research is needed to determine if there are consistent differences in these characters or just extensive individual variation. It has been shown that UV signatures, although invisible to the human eye, may separate sibling bird species (e.g. Bleiweiss 2004). To date, UV signals have been found only in the red patches in the primaries and secondaries, but not in the body plumage, of all species of *Turaco* as then constituted (Mullen & Pohland 2008). However, potential differences in UV reflection of, e.g., crest colour of *donaldsoni* and *leucotis* remain untested.

Conservation.—Whilst the range of *leucotis* covers large parts of Ethiopia and also parts of Eritrea and Sudan, the occurrence of *donaldsoni* is endemic to a comparatively small area of north-east Ethiopia, from Harar to the Arsi and Bale Mts. Forests in this montane region have largely disappeared today, except a few larger remnants (e.g. Din-Din, Kuni-Mukdar) and some widely scattered 'islands'. The devastation continues in parts of the range of *donaldsoni*, as we witnessed in 2019 and 2021 in the Oda Mts., south of the Shabelle River, in the northern Bale Massif (Fig. 7a,b). There is a lack of information on the distribution and abundance of *donaldsoni* where it persists, so that at present no reliable statements can be made concerning its IUCN threat status. Non-timber crops, logging, plantations and livestock farming have been listed among threats to *M. ruspolii*, which is currently classified as Vulnerable (BirdLife International 2022). The same threats are likely to affect *donaldsoni* and a proper assessment is therefore urgently required.

Remarks on English names.—Arthur Donaldson Smith (1866–1939) was an American traveller and big-game hunter who was active in Abyssinia and Somaliland in the late 19th century (Beolens *et al.* 2014). He collected the type of *donaldsoni*, which Sharpe (1895) named in his honour. Current English names also refer to him, for example in the National Center for Biotechnology Information database (www.ncbi.nlm.nih.gov). Whilst Smith's contribution to the biological exploration of the Horn of Africa is not in question, his pronounced imperialist worldview cannot be ignored. In his book (Smith 1897), he stated that England is 'left as free as France or Russia or any other nation to turn her attention to the acquisition of the vast and important territory in question', i.e. the entire area between the Somali coast and the Nile. The legitimacy of this claim was shared by many of his contemporaries, but neither then or now have the actions that resulted been just or morally acceptable. Another passage in Smith (1897) is no less thought-provoking. With obvious satisfaction he describes 'the battle' with the Borana, armed only with spears, in what is now southern Ethiopia: 'The firing was hot, and down went warriors, one on top of another. They held up their shields to protect themselves, and thus offered splendid marks for the



Figure 7a (above). Remnants of *Podocarpus* forest in the Oda Mts., which are heavily cultivated by smallholders. Crimson-crested Turaco *Menelikornis (l.) donaldsoni* survives here, despite the advanced state of habitat degradation. Figure 7b (below). Another former forest in an irreversibly devastated state, May 2021 (Kai Gedeon)

rifles'. In this context, a vernacular honorific appears inappropriate. Moreover, given the brilliant colour of the erect crest shown in Fig. 2, the name Maroon-crested Turaco used by del Hoyo & Collar (2014) seems less appropriate than Crimson-crested Turaco, which we here propose for *donaldsoni*.

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