BioOne COMPLETE

Two undescribed species of bird from West Africa

Authors: Boesman, Peter, and Collar, N. J.

Source: Bulletin of the British Ornithologists' Club, 139(2) : 147-159

Published By: British Ornithologists' Club

URL: https://doi.org/10.25226/bboc.v139i2.2019.a7

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

Two undescribed species of bird from West Africa

by Peter Boesman & N. J. Collar

Received 21 December 2018; revised 19 March 2019; published 17 June 2019

http://zoobank.org/urn:lsid:zoobank.org:pub:99EE9F1D-2FC9-41D5-8B39-0DCBB229EC0F

Summary.—Taxonomically undifferentiated western and eastern populations of Dusky Long-tailed Cuckoo *Cercococcyx mechowi* and Yellow-spotted Barbet *Buccanodon duchaillui* are known to have very different voices. The cuckoo has two song types, a melodious three-note whistle and a plaintive whinnying in West Africa west of the Bakossi Mountains in Cameroon, and a much less melodious, higher-pitched three-note whistle and a much faster whinnying in Central Africa east of the Bakossi Mountains. The barbet has an accelerating song of some 6–11 hoots west of the Dahomey Gap and a rapid rolling purr to the east. Even though in plumage and morphometrics there is no unambiguous diagnostic distinction between these two vocal groups, analysis of their vocalisations demonstrates a high degree of differentiation. We consider the western groups as species, naming the cuckoo for Françoise Dowsett-Lemaire and the barbet for Robert Dowsett.

Dusky Long-tailed Cuckoo *Cercococcyx mechowi* and Yellow-spotted Barbet *Buccanodon duchaillui* share much the same geographical range, extending through the Upper and Lower Guinea forest belt of West Africa, from Sierra Leone east discontinuously at the Dahomey Gap to Nigeria and thence Uganda (and for the barbet western Kenya), and south to northern Angola (del Hoyo & Collar 2014). They also share a curious characteristic, that their populations either side of a relatively narrow line (not the same line, however) have, quite recently, been found to possess markedly different songs. The revelation concerning the cuckoo appears first to have been made by Dowsett-Lemaire (1997), and in the case of the barbet by Borrow & Demey (2001). We cite the latter's information on both species in quotation marks in the following paragraph.

Each population of Dusky Long-tailed Cuckoo has two song-types. From Sierra Leone to western Cameroon, birds have (1a) a song of 'three rising notes, *hu hee wheeu*', and (1b) 'a less frequently uttered whinnying series of rather plaintive notes, first accelerating and then slowing and descending *tiutiutiutiutittiui-tiu-tiu-tiu*…, reminiscent of [a] *Halcyon* kingfisher'. From western Cameroon eastwards, birds have (2a) a faster song, 'with three similar, less melodious notes *wheet-wheet-wheet*' and (2b) 'a fast, descending *wheewheewheewheewhee*…, almost twice as fast as [the] equivalent in Upper Guinea'. For Yellow-spotted Barbet, the main call in the west of the range is 'a series of 7–10 accelerating *oop* notes similar to a song of Hairy-breasted Barbet' *Tricholaema hirsuta*, while in the east birds give 'a characteristic purring *rrurrrrrr*… (lasting 1–2 seconds), unique among [African] barbets, uttered by adult and juvenile'.

These remarkable circumstances have apparently gone unstudied. Both species are treated as monotypic in all recent world lists (Dickinson & Remsen 2013, del Hoyo & Collar 2014, Christidis *et al*. 2018, Clements *et al*. 2018, Gill & Donsker 2018), following the rejection of the cuckoo's proposed forms *wellsi* by Chapin (1928) and *occidentalis* (as a *nomen nudum*) by Dowsett & Dowsett-Lemaire (2015), and the barbet's proposed forms *ugandae* by Chapin (1939), *bannermani* by White (1965) and *gabriellae* (albeit in this case without explanation) by Short & Horne (2001). Yet vocalisations in almost all non-passerines, including cuckoos

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

ISSN-2513-9894 (Online)

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

(Payne 1997) and barbets (Kirschel *et al*. 2009), are innate and not learnt, so that any strong vocal difference is bound to reflect a strong taxonomic difference. Certainly there is no other known case in the Cuculidae or any of the barbets (Capitonidae, Megalaimidae, Lybiidae) in which a single taxon separates into two distinct vocal groups. To the contrary, some species of cuckoo in particular are now understood to separate on voice with relatively little distinction in morphology, e.g. Whistling Hawk-Cuckoo *Hierococcyx nisicolor*, Northern Hawk-Cuckoo *H. hyperythrus* and Sunda Cuckoo *Cuculus lepidus* (King 2002, 2005).

It might briefly be imagined that seasonal, age or sex differences could account for a single taxon possessing more than one vocalisation, but the complete geographical separation of vocal types places such a notion beyond plausibility (one might also note the indication above that the purr of eastern barbets is given 'by adult and juvenile'). We therefore investigated the cases of Dusky Long-tailed Cuckoo and Yellow-spotted Barbet with three questions in mind. First, are there subtle differences in plumage or morphometrics by which the different-voiced populations can be discriminated? Second, are these populations sufficiently different in voice to be considered separate species? Third, can we confirm that the lines separating the different-voiced populations fall for the cuckoo at the Sanaga River in Cameroon (as suggested by Dowsett & Dowsett-Lemaire 2015) and for the barbet at the Dahomey Gap between Ghana and Nigeria (as remarked by Borrow & Demey 2001)?

Methods

We examined and measured specimens held in the American Museum of Natural History, New York, USA (AMNH), Muséum National d'Histoire Naturelle, Paris, France (MNHN), Musée Royal de l'Afrique Centrale, Tervuren, Belgium (MRAC), Natural History Museum, Tring, UK (NHMUK), Naturhistorisches Museum, Vienna, Austria (NMW) and Museum für Naturkunde, Berlin, Germany (ZMB). Specimens examined were as follows. *Cercococcyx mechowi*, west of the Sanaga River in Cameroon: one male (MNHN), five males (but in the analysis three; see below), two females and one unsexed (NHMUK) and one male and two females (ZMB); and east of the Sanaga River: one unsexed (MNHN), ten males, four females and two unsexed (MRAC), five males (but in the analysis seven) and five females (NHMUK), one male and one female (NMW) and three males and two females (ZMB). *Buccanodon duchaillui*, west of the Dahomey Gap: two males (AMNH), one male (MNHN) and 14 males (NHMUK); and east of the Dahomey Gap: three males (AMNH) and 22 males (NHMUK). Mensural data were taken in millimetres using digital callipers accurate to two decimal points for bill from skull to tip, wing (chord) and tail (from point of insertion to tip). For *Cercococcyx mechowi* both sexes were sampled, owing to the paucity of specimens, and wings and tails were measured with a rule; for *Buccanodon duchaillui* only males were sampled, and the length of the red forecrown patch was also measured, from the base of the bill to the tip of the furthest red feather. Following evidence emerging from our research, we transferred two males of *Cercococcyx* in NHMUK (1923.10.26.69 and 1926.8.8.619), collected in the Foumban area of Cameroon, although west of the Sanaga River, to the eastern sample (see below concerning BLNScc20101 and the legend to Table 1a).

We assembled and analysed sound-recordings of the songs of the two species. We used all available online archives (Xeno-canto, Macaulay Library and Internet Bird Collection), the collection at the British Library and a commercial publication (Chappuis 2000) (see Appendix). From these we selected homologous self-advertising calls, prepared sonograms and manually measured basic sound parameters using CoolEdit Pro. To distinguish the two song types in the cuckoo, we call the first (1a and 2a above) 'short songs' and the second (1b and 2b above), because they are less frequent and seemingly more related to direct

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

interactions, 'long calls'. We also searched online for video evidence to confirm the identity of the singers reported on sound-recording websites.

To gauge the degree of difference between populations in voice, plumage and dimensions we made use of the system of scoring proposed by Tobias *et al*. (2010), in which an exceptional character (radically different coloration, pattern, size or sound) scores 4, a major character (pronounced difference in body part colour or pattern, measurement or sound) 3, medium character (clear difference, e.g. a distinct hue rather than different colour) 2, and minor character (weak difference, e.g. a change in shade) 1; a threshold of 7 triggers species status, which cannot be achieved by minor characters alone, and only three plumage characters, two vocal characters and two biometric characters (in both cases assessed for effect size using Cohen's *d* where 0.2–2.0 is minor, 2–5 medium and 5–10 major) and one behavioural or ecological character (allowed 1) may be counted; this system gives a score of 3 for parapatric relationships, 2 for a narrow (<200 km) hybrid zone (being evidence of strong resistance to phenotypic merging) and 1 for a broad (>200 km) hybrid zone.

To determine where the voices of the species change we mapped recordings and made inquiries of observers, in the case of *Cercococcyx* taking note of Dowsett & Dowsett-Lemaire (2015), who identified the Sanaga River in Cameroon as the line of separation, but also of the assertion by Chappuis (2000) that 'The zone of transition is situated in the region of the Cameroon mountains where the two populations are parapatric'.

TABLE 1A

Means ± standard deviations of measurements (in mm) of all specimens of western and eastern populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi*. Means of two male specimens (NHMUK 1923.10.26.69 and 1926.8.8.619) are bill 23.1, wing 136.0, tail 197.5; this consistency with eastern birds, plus the recording of a bird from the same area (near Foumban, Cameroon) singing an eastern-type song, led to these specimens being included in the sample of eastern birds (see Methods). [1] Sample size = 30; [2] sample size = 34; [3] sample size = 34.

	n	bill	wing	tail
Western population	10	22.82 ± 0.81	132.7 ± 3.59	185.6 ± 7.50
Eastern population	36	22.85 ± 0.87[1]	134.6 ± 4.02[2]	196.8 ± 7.83[3]

TABLE 1B

Means ± standard deviations of measurements (in mm) of male specimens of western and eastern populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi*. [1] Sample size = 19; [2] sample size = 20; [3] sample size = 20.

	n	bill	wing	tail
Western population	5	23.0 ± 0.96	132.4 ± 5.18	188.4 ± 5.13
Eastern population	21	22.84 ± 0.76[1]	134.9 ± 4.32[2]	195.6 ± 8.20[3]

TABLE 1C

Means ± standard deviations of measurements (in mm) of female specimens of western and eastern populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi*. [1] Sample size = 9; [2] sample size = 11.

	n	bill	wing	tail
Western population	4	22.4 ± 0.42	132.8 ± 1.5	179.5 ± 5.92
Eastern population	12	23.02 ± 1.12[1]	134.7 ± 3.95[2]	198.4 ± 7.80

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

ISSN-2513-9894 (Online)

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

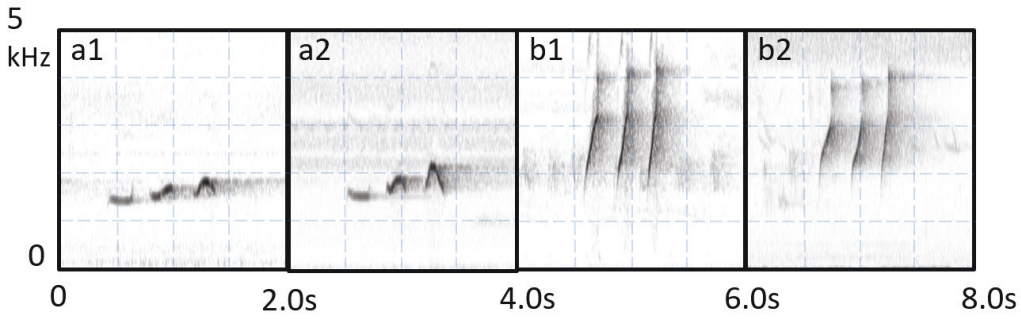


Figure 1. Sonograms of short song of western (a) and eastern (b) populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi* (a1: ML42772, Liberia, G. S. Keith; a2: CD, Nigeria, C. Chappuis; b1: CD, Gabon, C. Érard; b2: XC137037, Uganda, J. Engel).

Results, 1: evidence

Cercococcyx mechowi

Like Payne (2005), we could not discriminate any diagnostic plumage or mensural character between birds from west and east of the Sanaga River. Western birds are marginally smaller, with a tail *c*.10 mm shorter than those from the east (Table 1a; effect size −1.46, score 1). Chappuis (2000), evidently examining different material (we are unsure where; there is too little in MNHN to assess size), also considered eastern birds to be larger than western. However, the sample sizes are small and great caution is needed with these results; when broken down by sex, the difference in tail length lessens in males (Table 1b; effect size −1.05, but $n = 5$ for western birds) but increases in females (Table 1c; effect size −2.73, but $n = 4$ for western birds).

However, the voices of the populations are, as indicated by others, highly divergent. A video (https://www.youtube.com/watch?v=jM4fJSzc8jk) shows a singing bird in Ghana and establishes that indeed birds in the western part of the range are the source of the short song analysed below. Another video (hbw.com/ibc/1151514) made in Uganda documents the two distinct vocalisations, short song and long call, uttered by eastern individuals.

The short song of both consists of three (occasionally two) notes, but in western birds it is a leisurely rich whistled *tiuu-wip-wip* and in eastern birds a faster, higher, far less melodious *swiitwiitwiit*, in both cases stereotypical with very little variation. Analysis demonstrates that western birds have a song consisting of longer notes which reach a much lower frequency (Tobias criteria score 4) and have a much narrower frequency band (score 4), along with various other differing characters (Table 2), such that in sonograms they appear as dramatically different acoustic structures (Fig. 1a,b). Moreover the long calls, which are quite variable (and even might prove to be of two types in western birds), involve notes delivered about twice as fast in eastern populations (Fig. 3a,b), a further point of difference which would count highly if the Tobias criteria permitted three vocal characters to be scored.

The number of songs and calls sampled for this analysis is not large for the western group (see Appendix), but the results are geographically almost entirely consistent. The most obvious exception is a recording by C. Chappuis of a long call typical of eastern birds made at 'Nkounden, near Foumban, Cameroon' (BLNS cc20101), a site 120 km north-east of the Bakossi Mountains and 50 km west of the Sanaga River (Foumban also being the area from which two birds similar in size to eastern birds have been collected: see Methods and legend to Table 1a). Also requiring mention here are the long calls of a bird

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

TABLE 2
Means ± standard deviation of measurements of components in the short songs of western (n = 11) and eastern (n = 37) populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi*. s = seconds; e.s. = effect size; Ts = Tobias score (those used in the analysis in bold).

	western	**eastern**	**e.s. (Ts)**
Min. duration of note (s)	0.180 ± 0.011	0.093 ± 0.013	7.2 (3)
Max. duration of note (s)	0.214 ± 0.021	0.137 ± 0.013	4.4 (2)
Max. frequency (Hz)	2178 ± 161	4045 ± 144	12.2 (**4**)
Max. frequency range (Hz)	622.2 ± 150.2	2369 ± 182	10.5 (**4**)
Total phrase length (s)	0.921 ± 0.053	0.672 ± 0.036	5.5 (2)

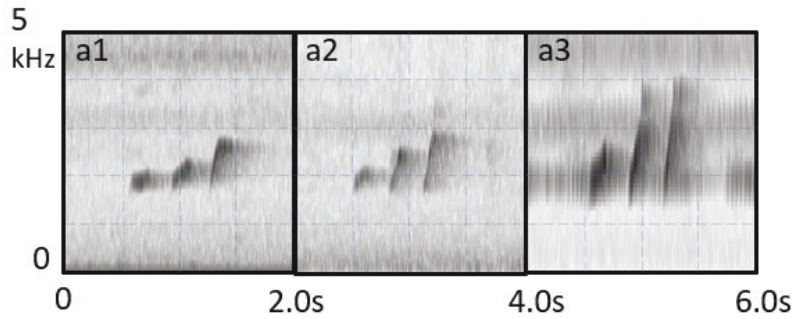


Figure 2. Sonograms of the short song of unassigned populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi* from the Bakossi Mountains, Cameroon, here considered intermediate between those of western and eastern populations (see Fig. 1) (a1: BLNS136888, M. Mills; a2: BLNS80394, F. Dowsett-Lemaire; a3: BLNS182020, M. Mills).

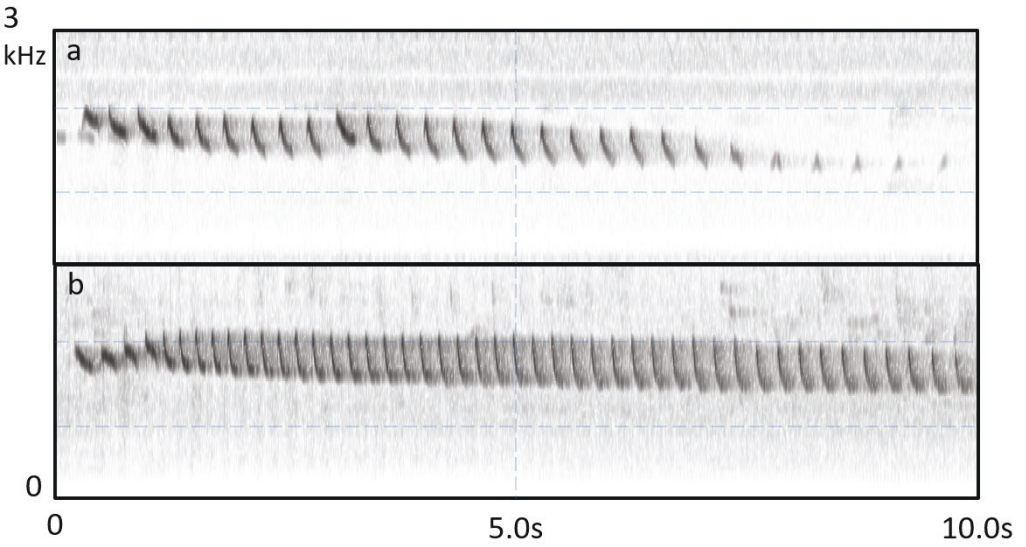


Figure 3. Long calls of western (a) and eastern (b) populations of Dusky Long-tailed Cuckoos *Cercococcyx mechowi* (a: CD, Nigeria, C. Chappuis; b: XC241398, Uganda, M. St-Michel).

on three consecutive days at Mt. Nlonako in western Cameroon (XC407506/ML91480081 and ML537132/134/167), which have, however, been judged not to emanate from a cuckoo but from another bird, probably a young raptor (F. Dowsett-Lemaire & R. J. Dowsett *in*

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

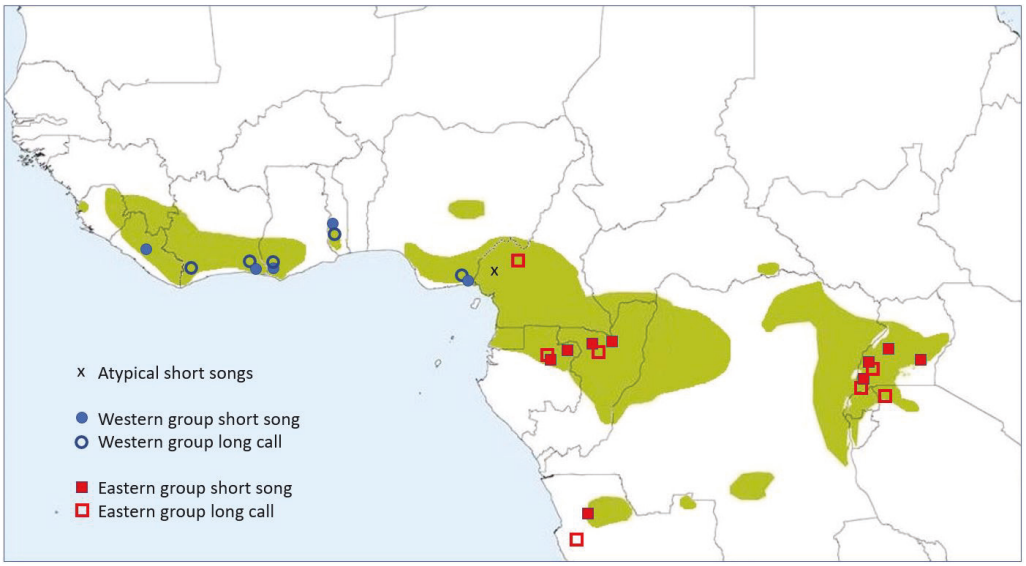


Figure 4. The global distribution of Dusky Long-tailed Cuckoo *Cercococcyx mechowi* with point localities for vocal groups based on recordings listed in the Appendix. The green area is the range as indicated in BirdLife International (2018) (with minor adjustments). The coloured point localities are explained in the internal legend. The Sanaga River lies east of the x for the atypical short songs. The open red square to the north-east of the x marks the Foumban area, where eastern-sized birds have been collected (see Methods and Table 1a), although it lies west of the Sanaga River.

litt. 2019). These calls have a pace which would place them in the eastern group, but they sound quite different from those further east. The site of the recordings is *c*.200 km from the Sanaga River, and less than 50 km from the Bakossi Mountains, where song typical of western birds has been reported (Dowsett & Dowsett-Lemaire 2015). However, while we accept the rejection of this anomalous record as a cuckoo, three other recordings clearly of cuckoos, BLNS 80394, 136888 and 182020, all from the Bakossi Mountains, reveal somewhat intermediate short songs, suggesting that at least some 'eastern birds' penetrate west of the Sanaga River and that these intermediate song types may reflect hybridisation over a very narrow zone (Fig. 2). However, with the exception of these intermediate short songs at this single locality, there is no indication of any clinal change in voice (Fig. 4).

Buccanodon duchaillui

We were unable to discriminate any diagnostic morphological differences between birds west and east of the Dahomey Gap, which appears to form the dividing line between the different-voiced populations (see Fig. 6), since birds in the Omo Forest Reserve, just east of Lagos in western Nigeria, sing with 'a single long purr' (S. Egbe *in litt*. 2018). It is *possible* that western birds have slightly fewer black markings on the breast-sides, flanks and belly, but this is probably an artefact of the particularly well-prepared specimens from Liberia by A. D. Forbes-Watson which comprise the bulk of the western sample we examined. Western birds are very slightly larger in size, with tails a mean 2 mm longer, yielding an effect size of 1.25 and a Tobias score of 1 (Table 3). The mean size of the red crown patch is, however, fractionally smaller (effect size −0.52; permissible score 1), but involves such extensive overlap as to be as useless a diagnostic character in the museum as it clearly would be in the field.

Birds in the western population sing a simple, accelerating series of typically 6–11 soft rich *uup* hoots, *uup uup-uup-uup-uupuupuup*. A video (hbw.com/ibc/1459316) documents

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

TABLE 3
Means ± standard deviations of measurements (in mm) of male specimens of western and eastern populations of Yellow-spotted Barbet *Buccanodon duchaillui*. 'Crown' = red crown patch. [1] Sample size = 24.

	n	bill	wing	tail	crown
Western population	17	16.42 ± 0.55	76.71 ± 2.11	42.12 ± 1.43	16.78 ± 1.82
Eastern population	25	16.18 ± 0.89	74.84 ± 2.76	39.96 ± 1.97	17.81 ± 2.15[1]

TABLE 4
Means ± standard deviation of measurements of components in the songs of western (*n* = 15) and eastern (*n* = 22) populations of Yellow-spotted Barbet *Buccanodon duchaillui*. Acceleration was determined by dividing the combined duration of the first two notes by the combined duration of the last two notes including the intermediate pause. s = seconds; e.s. = effect size; Ts = Tobias score (those used in the analysis in bold).

	western	eastern	e.s. (Ts)
Number of notes	8.533 ± 1.685	72.8 ± 16.76	5.38 (3)
Longest note (s)	0.245 ± 0.037	0.026 ± 0.004	8.32 (**3**)
Pace (notes per s)	4.165 ± 0.724	37.542 ± 3.54	13.06 (**4**)
Acceleration	2.211 ± 0.311	1.467 ± 0.159	3.01 (2)

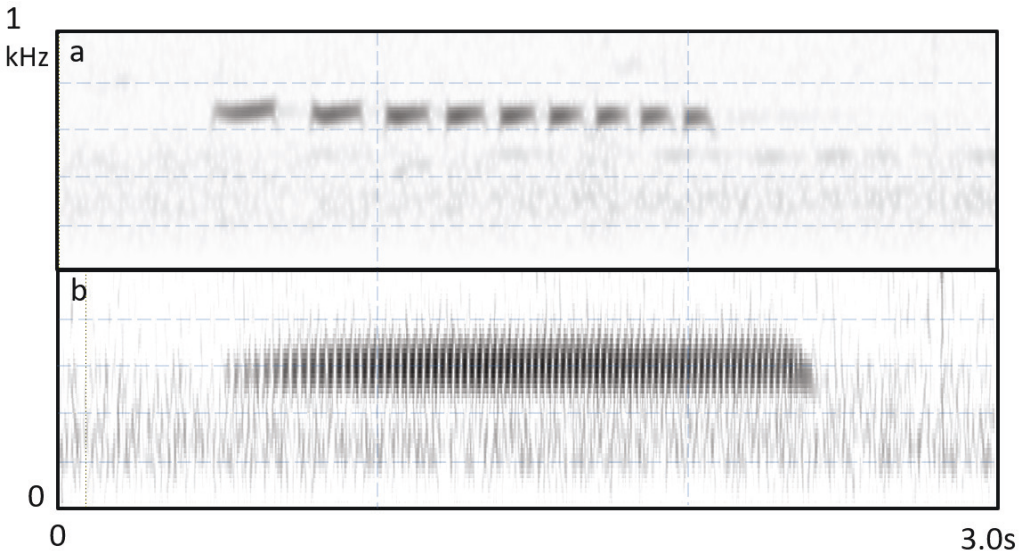


Figure 5. Songs of western (a) and eastern (b) populations of Yellow-spotted Barbet *Buccanodon duchaillui* (a: XC400183, Ghana, P. Åberg; b: ML46607, Tanzania, D. Moyer).

this song, and shows how a large patch of pink bare skin on the neck-side, sufficient to qualify as a visual signal, is exposed and pulses as the bird delivers its hoots. Eastern birds, by contrast, produce a sound very similar in tone and pitch to these hoots, but as a rapid rolling guttural purr, *rrrrrrrrrru*; whether bare skin is exposed during the delivery is apparently unknown, but Chapin (1939) was brought a 'brood of nestlings' which also gave this call, in which 'the head was extended, beak downwards, and the neck swelled decidedly, the skin showing at its sides'. Analysis (Table 4) reveals that western birds have a song with many fewer notes (no score permissible) which are much longer (score 3),

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

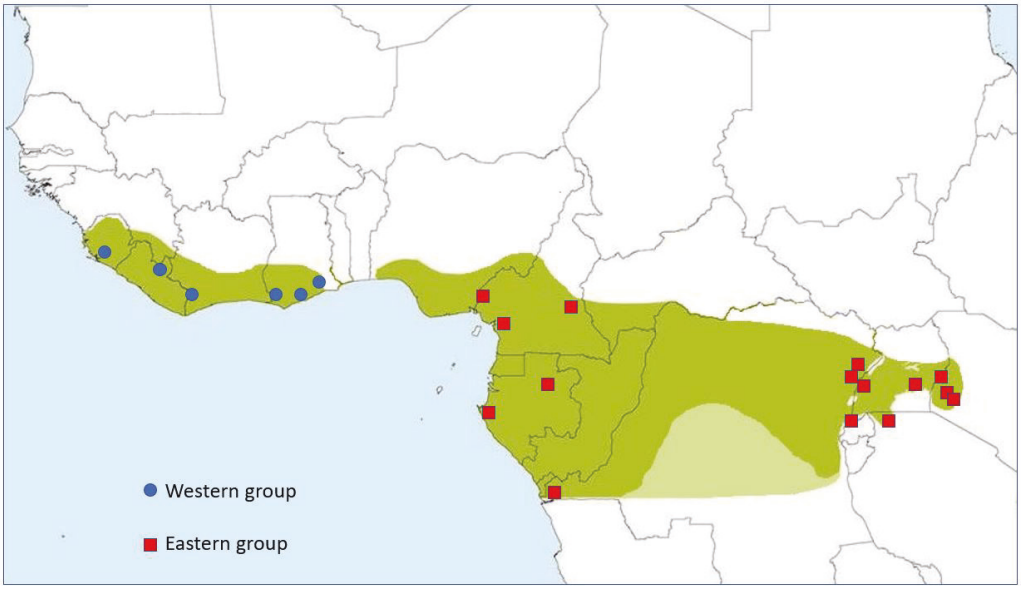


Figure 6. The global distribution of Yellow-spotted Barbet *Buccanodon duchaillui* with point localities for vocal groups based on recordings listed in the Appendix. The green area reproduces the range as indicated in BirdLife International (2018) (with minor adjustments, and pale green indicating uncertain occurrence). The coloured point localities are explained in the internal legend.

delivered far more slowly (score 4) but *accelerando* (no score permissible) (Fig. 5a,b). Also, in western birds amplitude is fairly constant while in eastern birds it shows a clear initial increase to reach a maximum after which it fades towards the end (no score permissible).

M. Mills informs us (*in litt*. 2018) that he once heard a barbet in Uganda deliver some hoots, although he made no note of the time, place or similarity to the hoots of western birds, and hoots are also mentioned as a secondary vocalisation in East African birds by Stevenson & Fanshawe (2002). However, the number of songs sampled for this analysis was substantial (see Appendix) and all yielded geographically consistent results. If eastern birds hoot, they must do so very rarely; and in the absence of further evidence to confirm this phenomenon or to indicate its similarity or difference to the hoots of western birds, we elect to set this testimony aside in the hope that future studies will elucidate the matter.

Results, 2: interpretation

Although we were able to find one minor distinction each in tail length between the western and eastern populations of the two species under review, we acknowledge that these involve average but not absolute differences, and are therefore indicative but not diagnostic. Nevertheless, the differences between the voices of western and eastern populations of Dusky Long-tailed Cuckoo and Yellow-spotted Barbet score sufficiently highly using the Tobias criteria for each population to be recognised as a separate species. The cuckoo scores 8 on voice, 2 for possible narrow hybrid zone and 1 for tail length, total 11, the barbet 7 on voice and 1 for tail length (crown patch score of 1 is technically permissible but too trivial, and is set aside here), total 8. The type localities for the species are both in the east of their ranges (*Cercococcyx mechowi* in Angola, *Buccanodon duchaillui* in Gabon), so the two new species refer to the western populations. In the following descriptions, colour names and numbers follow Smithe (1975).

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

ISSN-2513-9894 (Online)

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

***Cercococcyx lemaireae* sp. nov.**
Whistling Long-tailed Cuckoo

Holotype.—NHMUK 1977.20.179. Grassfield, Mt. Nimba, Liberia, 550 m, 11 August 1967, collected by A. D. Forbes-Watson.

Diagnosis.—Indistinguishable in morphology from *C. mechowi*, albeit with a tendency to slightly shorter wings and tail; but highly divergent in voice, with a short song consisting of a leisurely rich whistled *tiuu-wip-wip* (notes longer, at a much lower frequency and with a much narrower frequency band) rather than the faster, higher, far less melodious *swiitwiitwiit* of *C. mechowi*, and a long call delivered half as fast as that of *C. mechowi*; both vocalisations are presumably used in self-advertisement.

Description of the holotype.—Crown, nape, mantle and back dark grey (Blackish Neutral Gray 82), with wings similar but tinged dark brown (Sepia 219), and each primary and secondary carrying small dull rufous (near Mikado Brown 121C) triangles *c*.10 mm apart along the outer edge of the outer vane. Uppertail the same colour as the wings but appearing blackish (near Sepia 119) when feathers not fanned, with narrow whitish tips and very small buffy (near Pale Pinkish Buff 121D) notches *c*.10 mm apart on the edges of both vanes of each rectrix (also a few tiny white notches along the shafts of the outer rectrices). Sides of face dark grey (Medium Neutral Gray 85) with sparse whitish flecks on lores, cheeks and ear-coverts; chin to lower belly densely and boldly barred blackish (between Dark Brownish Olive 129 and Blackish Neutral Gray 82) on discoloured whitish background shot with buff (between Warm Buff 118 and Yellow Ocher 123C) across breast and on lower belly where the barring ceases; undertail-coverts warm buff (near Yellow Ocher 123C). Undertail blackish grey (near Sepia 119) with the notches of the uppertail showing whitish rather than buffy. 'Iris dark brown, eye-rim lemon yellow. Bill (upper mandible) blackish, (lower mandible) tip blackish, rest yellow tinged greenish. Feet: lemon yellow. Testis 6 mm. Weight 54.2 g' (A. D. Forbes-Watson label inscription). Bill from skull 22.5 mm, wing 135 mm, tail 193 mm.

Remarks.—*C. lemaireae* extends from Sierra Leone east to western Cameroon, with *C. mechowi* occupying the area from central Cameroon east to Uganda. As noted above, an informal name for the new species, '*occidentalis*', is a *nomen nudum* (Dowsett & Dowsett-Lemaire 2015). The type locality ('Bitye, R. Ja, Cameroon') of Bannerman's (1919) subspecies *wellsi*, long considered invalid—the form was not even mentioned by Irwin (1988) or Payne (1997, 2005) and our check of the type specimen (NHMUK 1920.6.26.108) reaffirmed this view (we included it in our mensural sample)—lies within the range of the eastern population (Dowsett & Dowsett-Lemaire 2015), so the name is unavailable in this context. The proposed English name seeks to capture the key tonal difference this species reveals in its voice, and we suggest retention of 'Dusky Long-tailed Cuckoo' for the now-restricted *C. mechowi*; but we acknowledge that with 'Whistling Yellowbill' *Ceuthmochares australis* and 'Whistling Hawk-Cuckoo' *Hierococcyx nisicolor* the Cuculidae may be sufficiently stocked with sibilant species. An alternative, in the interests of syllable reduction, might be to call the two species 'Western Dusky Cuckoo' and 'Eastern Dusky Cuckoo', although this would be to lose the generic English wording matching the etymology of '*Cerco-*' (tail) '*-coccyx*' (cuckoo). The very slightly smaller size of the new form was also noted by Chappuis (2000) and, with a sample size of 1, was speculated on by Chapin (1928).

Etymology.—We name this species for Françoise Dowsett-Lemaire, *née* Lemaire, whose achievements, alone and with her husband Bob Dowsett, have illuminated so many distributional, ecological, behavioural (notably vocal), taxonomic and conservation issues in ornithology across the African continent.

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

***Buccanodon dowsetti* sp. nov.**
Western Yellow-spotted Barbet

Holotype.—NHMUK 1977.20.505. Grassfield, Mt. Nimba, Liberia, 550 m, 24 August 1967, collected by A. D. Forbes-Watson.

Diagnosis.—Indistinguishable in morphology from *B. duchaillui*, albeit with a tendency to a slightly longer bill, wings and tail, and on average fractionally smaller red crown patch; but highly divergent in voice, the self-advertising song being a simple, accelerating series of typically 6–11 soft rich *uup* hoots, *uup uup-uup-uup-uupuupuup*, as opposed to a rapid rolling guttural purr, *rrrrrrrrrru*, in *B. duchaillui*, thus involving many fewer but much longer notes delivered far more slowly but *accelerando*.

Description of the holotype.—Forehead to mid-crown (line from rear edge of eye) dull crimson (Crimson 108); rest of crown to upper back glossy black (Jet Black 89), becoming matt black on lower back and wings; secondary wing-coverts, scapulars and lower back appearing spotted due to pale yellow (duller than Sulfur Yellow 157) tips, these becoming pale yellow lines on the primary wing-coverts and secondaries, and narrow scalloping on the rump and uppertail-coverts. Tail matt brownish black (near Sepia 219). Bold pale yellow (near Sulfur Yellow 157) line from rear of eye over ear-coverts to neck-side. Ear-coverts, lower face, lower neck-sides, chin, throat and upper breast glossy black, this extending as two broad lines onto middle and lower breast. Upper breast-sides to lower flanks broadly scaled pale yellow on black; centre of mid-breast to undertail-coverts pale yellow with very slight blackish scaling. Soft part colours 'as 785' (collector's number), for which is written: 'Iris brown, bare [eye-rim] black, bill black, feet grey'. 'Testis 5 mm. Weight 37.1 g' (A. D. Forbes-Watson label inscription). Bill from skull 16.5 mm, wing 75 mm, tail 42 mm.

Remarks.—*B. dowsetti* ranges from Sierra Leone east to southern Ghana, being wholly absent from Togo and Benin (F. Dowsett-Lemaire & R. J. Dowsett *in litt*. 2019), with *B. duchaillui* occupying the area from south-west Nigeria east to Kenya. All subspecies hitherto described—*bannermani* Serle, 1949 (type locality Bamenda, British Cameroons, type NHMUK 1949.14.4) and *gabriellae* Bannerman, 1924 (type locality Pangala, French Congo, type NHMUK 1924.7.15.1)—refer to the eastern population; it is perhaps worth noting that *gabriellae*, rejected without explanation by Short & Horne (2001), appeared valid to Chapin (1939), as it does to us. The proposed English name predicates that eastern *B. duchaillui* will become known as 'Eastern Yellow-spotted Barbet'.

Etymology.—We name this species for Robert J. (Bob) Dowsett, who has for half a century been the standard-bearer for African ornithology, producing (with various co-authors but notably his wife Françoise Dowsett-Lemaire) a series of national avifaunas of immense authority and rigour, documenting the birds of multiple protected areas, studying the migrations of Palearctic passerines, and providing the taxonomic backbone for the entire Afrotropical region.

Discussion

While an attempt to name a new species *Caprimulgus kwalensis* on the basis of a sound-recording (Davis 1978) was rejected for lack of a specimen (Vuilleumier *et al*. 1992), we know of only a single case where a species has previously been established on the basis of vocalisations without possessing any (not even average) plumage or morphometric differences: Mees's Nightjar *Caprimulgus meesi* was identified as a new taxon from islands in Wallacea that were until then thought to be inhabited by taxonomically undifferentiated

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

populations of Large-tailed Nightjar *C. macrurus* (Sangster & Rozendaal 2004). Almost in the same category, however, is the recent split of Sula Cuckoo-dove *Turacoena sulaensis* from the supposedly monotypic White-faced Cuckoo-dove *T. manadensis*, based entirely on vocal differences in a paper that did not seek to check the validity of the weak morphological characters on which the commonly synonymised '*sulaensis*' was proposed in 1900 (Ng & Rheindt 2016).

In a CD booklet that was regrettably doomed to be widely overlooked, Chappuis (2000) argued that the two vocal types of *Cercococcyx mechowi* each merited species rank based on the facts that (a) differences in the innate vocalisations of cuckoos have the exact equivalence of visual differences, (b) each vocalisation is unaltered in any way across the large expanse of the ranges in question, (c) playback of eastern vocalisations to western birds produced no reaction, and (d) the larger eastern birds paradoxically have the higher-pitched voice. We commend this judgement and, of course, concur with it unreservedly. A strong divergence in voice with little or no divergence in physical appearance is far more indicative of the likelihood of real reproductive incompatibility than a strong genetic divergence with 'no readily apparent differences… in vocalizations', as presented in the proposed split of the two subspecies that comprise Barred Long-tailed Cuckoo *C. montanus* (Engel *et al*. 2014)—an arrangement not adopted to date by any of the main world lists of bird species (del Hoyo & Collar 2014, Christidis *et al*. 2018, Clements *et al*. 2018, Gill & Donsker 2018).

Ideally, Chappuis' playback experiment would be extended by playing western calls to eastern birds, and a similar pair of experiments undertaken for the two populations of the barbet. However, as the study of *Turacoena sulaensis* shows, the absence of such evidence need not and should not be an obstacle to the advancement of taxonomic hypotheses if these are based on other strong evidence. We are, in any case, reassured that Chappuis has already gone halfway in this issue with the cuckoo, and that playback experiments with African barbets demonstrate that they can discriminate even subtle differences in voice (Kirschel *et al*. 2009), even if this does not mean they remain unresponsive to poor imitations or indeed to calls of other species (F. Dowsett-Lemaire *in litt*. 2019). We strongly encourage playback trials with all of the taxa here delineated, but expect the results to support the conclusions we reach.

Such work would most interestingly be undertaken in the areas where the species replace each other. Confirmation of the Bakossi Mountains as a narrow hybrid zone for the cuckoo would be welcome, as would a study of the environs of the Sanaga River as an area of taxon interchange—from the maps in Borrow & Demey (2001) it appears to be for Yellow-footed Honeyguide *Melignomon eisentrauti* vs. Zenker's Honeyguide *M. zenkeri* and Blue-moustached Bee-eater *Merops mentalis* vs. Blue-headed Bee-eater *M. muelleri*. An exploration of the wooded areas that mark the break in forest continuity known as the Dahomey Gap, especially in western Nigeria, would help confirm the point where the barbets change over.

Acknowledgements

We thank the staff of AMNH (Paul Sweet, Tom Trombone), MNHN (Patrick Boussès, Jérôme Fuchs), MRAC (Alain Reygel), NHMUK (Mark Adams, Hein van Grouw), NMW (Hans-Martin Berg) and ZMB (Sylke Frahnert, Pascal Eckhoff), who kindly permitted access to specimens in their care, as well as the many field workers who have made their recordings available for study (Appendices 1–2). We also thank Michael Mills and Derek Pomeroy for information relating to the barbet in the east of its range. Phil Hall, Fábio Olmos, Shiiwua Manu and Stella Egbe aided our inquiries into where the barbets might replace each other. Ron Demey and Lincoln Fishpool were helpful referees, while Françoise Dowsett-Lemaire and Bob Dowsett were the paper's sternest critics. Nomenclature in this paper was reviewed by the Working Group on Avian Nomenclature of the International Ornithologists' Union.

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

ISSN-2513-9894 (Online)

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

References
Bannerman, D. A. 1919. [Description of new birds from Africa]. *Bull. Brit. Orn. Cl*. 40: 7–9.
Bannerman, D. A. 1924. [Description of a new barbet from the French Congo—*Buccanodon duchaillui gabriellae*]. *Bull. Brit. Orn. Cl*. 44: 100–101.
BirdLife International. 2018. Species factsheets: *Cercococcyx mechowi* and *Buccanodon duchaillui*. http://www.birdlife.org (accessed 18 October 2018).
Borrow, N. & Demey, R. 2001. *Birds of western Africa*. Christopher Helm, London.
Chapin, J. P. 1928. The African cuckoos of the genus *Cercococcyx*. *Amer. Mus. Novit*. 313: 1–11.
Chapin, J. P. 1939. The birds of the Belgian Congo, part II. *Bull. Amer. Mus. Nat. Hist*. 75.
Chappuis, C. 2000. *Oiseaux d'Afrique*, 2. West and Central Africa. 11 CDs. Société d'Études Ornithologiques de France, Paris.
Christidis, L. & unspecified co-workers. 2018. *The Howard and Moore complete checklist of the birds of the world*, v 4.1. https://www.howardandmoore.org.
Clements, J. F., Schulenberg, T. S., Iliff, M. J., Roberson, D., Fredericks, T. A., Sullivan, B. L. & Wood, C. L. 2018. The eBird/Clements checklist of birds of the world: v2018. http://www.birds.cornell.edu/clementschecklist/download/.
Davis, L. I. 1978. More African nightjars. *Pan Amer. Stud.* 1(2): 43–52.
Dickinson, E. C. & Remsen, J. V. (eds.) 2013. *The Howard & Moore complete checklist of the birds of the world*, vol. 1. Fourth edn. Aves Press, Eastbourne.
Dowsett, R. J. & Dowsett-Lemaire, F. 2015. The status of the name '*occidentalis* Chappuis' for the Dusky Long-tailed Cuckoo *Cercococcyx mechowi*. *Bull. Brit. Orn. Cl*. 135: 352–353.
Dowsett-Lemaire, F. 1997. The avifauna of Odzala National Park, northern Congo. Pp. 15–48 *in* Dowsett, R. J. & Dowsett-Lemaire, F. (eds.) *Flore et faune du Parc National d'Odzala, Congo*. Tauraco Press, Liège.
Engel, J. I., Byamana, K., Kahindo, C., Bates, J. M. & Fjeldså, J. 2014. Genetic structure offers insights into the evolution of migration and the taxonomy of the Barred Long-tailed Cuckoo *Cercococcyx montanus* species complex. *Ibis* 156: 330–340.
Gill, F. B. & Donsker, D. (eds.) 2018. IOC World Bird List (v8.2). http://www.worldbirdnames.org/.
del Hoyo, J. & Collar, N. J. 2014. *The HBW and BirdLife International illustrated checklist of the birds of the world*, vol. 1. Lynx Edicions, Barcelona.
Irwin, M. P. S. 1988. Order Cuculiformes. Pp. 58–104 *in* Fry, C. H., Keith, S. & Urban, E. K. (eds.) *The birds of Africa*, vol. 3. Academic Press, London.
King, B. F. 2002. The *Hierococcyx fugax*, Hodgson's Hawk Cuckoo, complex. *Bull. Brit. Orn. Cl*. 122: 74–80.
King, B. F. 2005. The taxonomic status of the three subspecies of *Cuculus saturatus*. *Bull. Brit. Orn. Cl*. 125: 48–55.
Kirschel, A. N. G., Blumstein, D. T. & Smith, T. B. 2009. Character displacement of song and morphology in African tinkerbirds. *Proc. Natl. Acad. Sci. USA* 106: 8256–8261.
Ng, N. S. R. & Rheindt, F. E. 2016. Species delimitation in the White-faced Cuckoo-dove (*Turacoena manadensis*) based on bioacoustic data. *Avian Res*. 7: 2.
Payne, R. B. 1997. Family Cuculidae (cuckoos). Pp. 508–607 *in* del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of birds of the world*, vol. 4. Lynx Edicions, Barcelona.
Payne, R. B. 2005. *The cuckoos*. Oxford Univ. Press.
Sangster, G. & Rozendaal, F. G. 2004. Systematic notes on Asian birds. 41. Territorial songs and species-level taxonomy of nightjars of the *Caprimulgus macrurus* complex, with the description of a new species. *Zool. Verhand. Leiden* 350: 7–45.
Serle, W. 1949. A new genus and species of babbler and new races of a wood-hoopoe, swift, barbet, robin-chat, scrub-warblers and apalis from West Africa. *Bull. Brit. Orn. Cl*. 69: 50–56.
Short, L. L. & Horne, J. F. M. 2001. *Toucans, barbets and honeyguides*. Oxford Univ. Press.
Smithe, F. B. 1975. *Naturalist's color guide*. Amer. Mus. Nat. Hist., New York.
Stevenson, T. & Fanshawe, J. 2002. *Field guide to the birds of East Africa*. T. & A. D. Poyser, London.
Tobias, J. A., Seddon, N., Spottiswoode, C. N., Pilgrim, J. D., Fishpool, L. D. C. & Collar, N. J. 2010. Quantitative criteria for species delimitation. *Ibis* 152: 724–746.
Vuilleumier, F., LeCroy, M. & Mayr, E. 1992. New species of birds described from 1981 to 1990. *Bull. Brit. Orn. Cl*. 112A: 267–309.
White, C. M. N. 1965. *A revised check list of African non-passerine birds*. Govt. Printer, Lusaka.

Addresses: Peter Boesman, Duinenweg 3, B-2820 Rijmenam, Belgium, e-mail: Tangara@skynet.be. N. J. Collar, BirdLife International, Pembroke Street, Cambridge CB2 3QZ, UK; and Bird Group, Dept. of Life Sciences, Natural History Museum, Tring, Herts HP23 6AP, UK.

Appendix. Sources for the vocalisations of Dusky Long-tailed Cuckoo *Cercococcyx mechowi* and Yellow-spotted Barbet *Buccanodon duchaillui*. All recordings were listened to as a means to check specific features, while a subset of these (of sufficient quality) was used to measure basic sound parameters: for *Cercococcyx* short song west 12 recordings (11 measured), short song east 42 (37); long call west 5 (5), long call east 11 (10),

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*
ISSN-2513-9894 (Online)
Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

unassigned 7; for *Buccanodon* west 20 (15), east 51 (22). BLNS = British Library (Wildlife and Environmental Sounds), CD = Chappuis (2000), ML = Macaulay Library, IBC = Internet Bird Collection, XC = Xeno-canto.

Cercococcyx mechowi

Short song (***western group***): XC179067, Ghana, G. Wagner; ML23322 and 42772, Liberia, S. Keith; ML101953, Ivory Coast, I. Sinclair; ML146935, Ghana, M. Robbins; CD, Nigeria, C. Chappuis; private, Togo, F. Dowsett-Lemaire; BLNS180102/106/108/109, Ghana, M. Mills; BLNS33605, T. Bara, Ivory Coast; (***eastern group***): XC59080, Uganda, M. Claassen; XC137036/7, Uganda, J. Engel; XC138905/156751, Uganda, B. Piot; XC157034, Uganda, H. Groot; XC166360/166368/166386, Uganda, S. Bot; XC179678, Uganda, C. Wanyama; XC186102, Uganda, N. Perrins; XC241396, 241398/9, 241401, 283229, 287831, 280240 and 292240, Uganda, M. St-Michel; XC303069/70, Uganda, S. Dereliev; XC342702, J. Betleja; XC432516, Uganda, B. Edmonston; ML94116/94719, Tanzania, D. Moyer; ML102134, Gabon, I. Sinclair; ML107792/3, Tanzania, C. McBride; CD, Gabon, C. Érard; private, 'Congo', F. Dowsett-Lemaire; BLNS137243/244/513/526 and 212814 and 221271, Uganda, M. Mills; BLNS137805 and 199770, Angola, M. Mills; BLNS15559, Uganda, P. Boston; BLNS32790 and 32765, Gabon, T. Gullick; BLNS25520, 'Congo', P. Huguet. **Long call** (***western group***): XC419773, Ivory Coast, E. Leroy; ML101953, Ivory Coast, I. Sinclair; CD, Nigeria, C. Chappuis; private, Togo, F. Dowsett-Lemaire; BLNS180109, Ghana, M. Mills; (***eastern group***): XC312502, Uganda, M. St-Michel; ML26327, Uganda, S. Keith; ML94166/8, Tanzania, D. Moyer; IBC1130656, Uganda, J. del Hoyo; private, 'Congo', F. Dowsett-Lemaire; BLNS137243/221271, Uganda, M. Mills; BLNS137805, Angola, M. Mills; BLNScc20101, Cameroon, C. Chappuis; BLNS1524, Gabon, T. Gullick. **Unassigned** ML537132/537134/537167, Cameroon, M. Robbins; XC407506, Cameroon, J. Cooper; BLNS80394, Cameroon, F. Dowsett-Lemaire; BLNS136888 and 182020, Cameroon, M. Mills.

Buccanodon duchaillui

Western group: XC104304/5, Ghana, M. Nelson; XC169720, Ghana, S. Bot; XC353155, Ghana, H. Matheve; XC360423, Ghana, J. Lidster; XC395749, J. Honkala; XC397057, Ghana, P. de Rouw; XC400182/183 and 400460, Ghana, P. Åberg; XC419616, Ghana, B. Edmonston; XC353565, Ivory Coast, E. Leroy; ML23321/29, Liberia, S. Keith; XC24893, Sierra Leone, F. Lambert; BLNS35136, Ivory Coast, A. Greensmith; BLNS180110/111/112 and 180128, Ghana, M. Mills. ***Eastern group***: XC99886/7/8/9, Cameroon, M. Nelson; XC263478, Cameroon, J. Cooper; ML176505, Cameroon, P. Rodewald; ML212483, 212507, 212522 and 212556, Cameroon, M. Robbins; ML1132, 1173, 1412, DR Congo, P. Kaestner; ML93930/933, Gabon, L. Macaulay; ML102133, Gabon, I. Sinclair; XC101228, Kenya, J. Bradley; XC233336, Kenya, T. Sirotkin; ML51528, 51539, 51558, 51575, Kenya, J. Horne; XC55001, Tanzania, M. Claassen; ML45774, 46560, 46605, 46606, 46607, Tanzania, D. Moyer; XC138932/3, Uganda, B. Piot; XC245978, 246010, 263445, 263449, 264914, 267371, Uganda, M. St-Michel; XC281973, Uganda, R. de By; ML24808/814, Uganda, S. Keith; BLNScc1946, Gabon, C. Chappuis; BLNScc1947, Cameroon, C. Chappuis; BLNScc22616, Kenya, C. Chappuis; BLNS59271, Cameroon, N. Gardner; BLNS80611, 'Zaïre', C. Carter; BLNS196321/399/401/402 and 198811 and 199258, Kenya, A. Gregory; BLNS16667, Kenya, R. Vicker.

© 2019 The Authors; *This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

ISSN-2513-9894 (Online)

Downloaded From: https://bioone.org/journals/Bulletin-of-the-British-Ornithologists'-Club on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use