

THE AFRICAN EMERALD CUCKOO,
CHRYSOCOCCYX CUPREUS

BY R. E. MOREAU AND JAMES P. CHAPIN

Chrysococcyx cupreus (Shaw) is a parasitic cuckoo confined to Africa and characteristically belonging to the canopy of evergreen forest. It follows that throughout West Africa it is a lowland bird, but in Abyssinia it is a highland form, inhabiting the forest from 6000 to 10,000 feet (cf. Heuglin *cit.* Reichenow), while in Kenya and Tanganyika Territory it seems almost to be confined to the intermediate altitudes (3000 to 7000 ft.). Farther from the Equator in eastern Africa it inhabits lower country, typically 2000 to 3000 feet in Nyasaland (Belcher, 1930).

In Natal, Vincent (1934: 761) agrees with other authors in regarding the Emerald Cuckoo as a forest bird; but in Portuguese East Africa, as it happens, one of the specimens he collected was in *Brachystegia* and the other (still being fed by a Puffback Shrike) in "thorn and baobab country."

The male is metallic green above, yellow below from the breast downwards. The female is brown above, barred with green, and white below, thickly barred with green. In view of the difficulty of detecting such birds in their evergreen environment, it is impossible to be certain whether they are present or not at seasons when they are not calling, but some definite statements have been made about long-distance migration of Emerald Cuckoos within the African continent. Some recent ornithologists admit three subspecies, others only two, and moreover there is no agreement about the ranges of the described forms, which incidentally do not correspond to the altitudinal differences indicated above. The species has been singularly unfortunate in its treatment in literature, but the nomenclatural difficulties were cleared up by Bannerman (1922), following Grant (1915).

The attention of one of us (R. E. M.) was first drawn to the problems presented by this cuckoo by reports of birds presumably on migration (see below) in the dry thorn-bush of central Tanganyika Territory. It seemed that the alleged migrations of the species might be elucidated and at the same time the geographical variation re-investigated by the help of elementary statistical methods. A special effort was made to use not only the series available in the British Museum and that formerly at Tring, which seem between them to have been the basis of nearly all the previous taxonomic work on the species, but also the specimens possessed by other museums. In correspondence it was

found that the other author (J. P. C.) had important unpublished notes on the species, and the collaboration expressed in the present paper is the outcome.

Our grateful thanks for the loan of specimens are due to Professor J. Berlioz (Paris Museum), Dr. Helge Bergman (Malmö Museum), Dr. V. FitzSimons (Transvaal Museum), Count Nils Gyldenstolpe (Stockholm Museum), Professor F. Olbrechts and Dr. H. Schouteden (Tervuren Museum), Mr. J. L. Peters (Mus. Comp. Zool., Harvard). Professor E. Stresemann and Dr. W. Meise have also contributed measurements and data of Berlin specimens, and Mr. J. G. Williams of the only two males in the Coryndon Museum, Nairobi. We are indebted to Dr. D. J. Finney and Mr. J. M. Hammersley for statistical advice.

GEOGRAPHICAL VARIATION

Southwards the species extends to the Cape Province. Its northern limit is a little uncertain but can be approximately determined on ecological grounds. Bannerman (1939) describes it as "primarily a dense forest species which does not occur very far north of the forest belt." This would put the northern limit of the species not far from 8° N. throughout West Africa and in fact the northernmost records are Bates' (1930) (by sound) at Yola in Nigeria at about 9° N. and two Berlin specimens from about 8° 20' N. in the Cameroons (Meise *in litt.*). Farther east there is no record north of the Belgian Congo border (5° N.) except one at 6° N. in the Sudan, and, given the nature of the country, it is improbable that the Emerald Cuckoo does breed north of this. The significance of this point will become apparent when the northern populations of the species are discussed below.

In the extreme northeast of the species' range the same ecological considerations do not hold good because the Abyssinian-Eritrean plateau carries highland forest several hundred miles farther from the Equator, actually to 17° north. Recent authors quote "southern Abyssinia" as the Emerald Cuckoo's northeastern limit and we have not been able to hear of any specimen in existence from north of about 9° N. near the latitude of Addis Ababa; but it is not clear that we are justified in rejecting the definite statement of Heuglin (*cit.* Reichenow), who specified the two localities "Anseba-tal" and "Mareb-tal" (*ca.* 15° N.), that the Emerald Cuckoo extends to 17° N.

The criteria hitherto used by authors in recognizing subspecies of this bird have been, in order of increasing importance attributed to them: barring of female underparts; color of under tail-coverts; and tail-length. All authors have previously been of the opinion that wing-

length does not vary geographically. Actually there is a certain difference of some interest, which will be dealt with briefly. Also, now that better series are available from the Gulf of Guinea islands a character not hitherto recognized in the species becomes evident, namely the pattern of the outer tail-feathers.

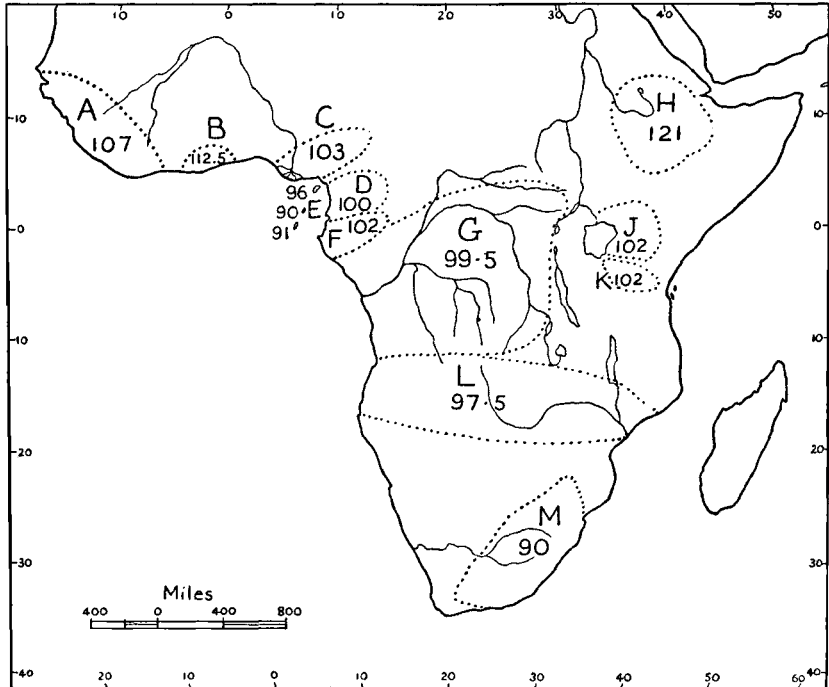


FIGURE 1.—Mean Tail-lengths of Emerald Cuckoo Populations (males). For ranges of length and standard deviations see Table 2.

Ranges and measurements that have been given by various authors are shown below. In no case is there an indication of the frequency distribution within the size-range quoted, and there has apparently been some copying, without specific acknowledgment, from one author to another.

Chrysococcyx c. cupreus (Shaw). Type-locality restricted by Grant (1915) to Gambia.

RANGE: "Gambia and south Abyssinia, south to about the Equator [*i. e.* including most of Uganda and Kenya]. Also Fernando Po, São Tomé and Príncipe" (Slater, 1924).

"From Gambia through the whole of Upper Guinea eastwards to southern Abyssinia" [*i. e.* excluding Kenya and Uganda and the

islands] (Bannerman, 1933). Chapin (1939) agrees. It may be noted that Bannerman's record (*ibid.*) of *C. c. intermedius* from Yola, which is within the area he quotes for *C. c. cupreus*, is due to a misapprehension. The record by Bates (1930), on which Bannerman's is based, was only on having heard this cuckoo at Yola; and hence no subspecific allocation was possible.

"African forest belt from Gambia to Ethiopia, and south to the Ivory Coast, Gold Coast and Southern Nigeria" (Peters, 1940). The wording is unfortunate and the meaning not clear, since there is no "forest belt" (in the usual sense of "evergreen forest") north of the Ivory Coast and Southern Nigeria.

TAIL-LENGTHS: 101–131, av. 112.3 mm., Gambia—S. Nigeria; 99–136, av. 117.2, Abyssinia (Bannerman, 1922). 105–133, Gambia—Gold Coast (Bates, 1930). 101–136 (Chapin, 1939).

C. c. intermedius Hartlaub. Type-locality Gaboon.

RANGE: "Gaboon south to Cape Province: south of the Zambesi only from October–March and probably breeding" (Sclater, 1924). "Cameroon to Mt. Elgon and south to southern Angola and the Zambesi" (Chapin, 1939). "Cameroon, Gaboon, São Tomé, Príncipe, Fernando Po, extending east through the Belgian Congo to Kenya and Uganda" (Bannerman, 1933). "Cameroon eastward to Uganda and Kenya Colony, south to Gaboon and southern Belgian Congo; islands of Fernando Po, Príncipe and São Tomé. Recorded from the Tete Province, Mozambique" (Peters, 1940).

TAIL-LENGTHS: Cameroon, Príncipe, São Tomé, 89–105 mm., av. 97.1; Gaboon, 90–107, av. 97; Kenya, Uganda, and Belgian Congo, 86–120, av. 100 (Bannerman, 1922: 417–418). Summarized (*ibid.*: 420) as 97–100 by a clerical error which has been uncritically reproduced by Friedmann and Loveridge (1937). South Cameroon, 98–110 (Bates, 1930). [Entire range] 85–107 (Chapin, 1939). Kenya and Uganda, 102–107, av. 104.5 (van Someren, 1925).

C. c. sharpei van Someren (1922). He gives no description in regular form and applies his new name simply to "the South African bird," without designating either type or range. The localities he quotes for it, without explanation, are in Uganda, and are due to a clerical error (van Someren, 1925). Hartert subsequently designated the type-locality as Ifafa R., Natal (Nov. Zool., 32: 154, 1925).

RANGE: "South Africa" (van Someren, 1922). "Angola, Transvaal, Natal" (Bannerman, 1922). "South Angola, Northern Rhodesia (Kafue River and Zambesi District), south through the Transvaal and Natal to Cape Province" (Peters, 1940).

TAIL-LENGTH: 86–98, av. 91 (Bannerman, 1922); “averages 6 or 7 mm. shorter than in *intermedius*,” that is, maximum presumably about 100 (Chapin, 1939); 85–94 (Roberts, 1940).

It will be seen that authors disagree about the ranges of all three subspecies to the extent of several hundred miles north and south, and also about the allocation of the insular populations in the Gulf of Guinea.

The insular populations.—More extensive series from São Tomé, Príncipe, and Fernando Po are available to us than to previous workers. They show that the birds of the first two islands are in fact distinct from all the continental populations, and not least from those geographically nearest. In the first place the pattern of the outer tail-feathers of the insular birds is peculiar; and secondly, their tails are shorter than those of all others except the South African (difference in means statistically significant, $P < .01$). These insular birds are formally described below.

The Fernando Po population, which is closer inshore than those of the other islands, must be classed as intermediate. The pattern of the outer tail-feathers is not so consistently different from that of the continental birds. Moreover the mean of the tail-length in Fernando Po is not significantly less than that of the opposite mainland (S. Cameroon), and it is not quite significantly greater than that of the outer islands ($P = .065$).

The Emerald Cuckoos of the Gulf of Guinea islands occupy a highly peculiar position in the insular avifaunae. They provide the only example of a land species common to all three islands and of a land subspecies common to two. And there appears to be no parallel case of a Fernando Po population being intermediate between an insular and a continental form.

***Chrysococcyx cupreus insularum*, new subspecies**

DESCRIPTION:—Differs from the races occupying the mainland of Africa by the great reduction of whitish areas on the outer rectrices of adult males, and from all other populations save *C. cupreus sharpei* by the shortness of its tail.

The outermost pair of rectrices is never so regularly barred with white as it is normally in males from the continent. In addition to the white apical spot there frequently are two white areas on the outer web, and these may or may not extend over on to the inner web. There they are apt to become reduced to spots, and never reach the inner margin if the bird is adult. In some males there is almost no

light color except the apical spot; the specimen selected as the type has little more than a suggestion of a white streak along the shaft.

The under tail-coverts of males are very often uniform yellow, sometimes spotted with glossy green, and never barred regularly in adult males. Females are scarcely distinguishable from mainland birds but are heavily barred with glossy green on breast and on wings.

TYPE:—Adult male; Amer. Mus. Nat. Hist., No. 266075; north end of Principe Island; September 27, 1928; collected by J. G. Correia. Wing, 105 mm.; tail, 89 mm.; culmen to base, 20 mm.

RANGE:—Islands of Principe and São Tomé in the Gulf of Guinea. Occasional male specimens from Fernando Po may be found to resemble *insularum*, but the majority have larger white areas on outer rectrices and are better referred to *cupreus*.

Female plumage.—Bannerman (1922), van Someren (1922), and Friedmann and Loveridge (1937) all state that the South African females are more “finely” barred (or less “heavily” barred) than “Gaboon” or “northern” birds. It is probable that these views were not all arrived at independently and it is certain that they were not based on adequate series. After examining all the available specimens it appears to us that the distinction has no validity.

Under tail-coverts.—Stress has been laid on the fact that the ground color of the under tail-coverts is white in all South African specimens, while yellow occurs in all other areas. The significance of this seemed uncertain because, as Bannerman (1933) points out, fading seems to be important (and most South African specimens happen to be particularly old, over 40 years). In recent months Dr. Herbert Friedmann has examined four fresh skins of adult males of *C. c. sharpei* in South Africa, and he reports that the barring of the under tail-coverts is really white.

The prevalence of marking in the under tail-coverts does, however, show interesting variations. The types into which the under tail-coverts are divisible for the present purposes are: (1) “plain”; (2) “spotted or tipped,” which includes those in which the maximum marking on any feather is a single irregular bar entering both vanes; and (3) “barred,” in which some feathers have two bars or both spot and bar. The numbers of each of these variants found in the specimens examined for this character are shown in Table 2. It will be seen that plain under tail-coverts do not, as has been suggested, predominate anywhere; there is a significantly small proportion of barred under tail-coverts in Abyssinia and the Gulf of Guinea islands, and a remarkable absence of spotted and plain in South Africa.

Wing-length.—Table 1 shows the great extent of the overlap in range of wing-length for all parts of Africa; nevertheless there is geographical variation in the means, which is statistically significant, as confirmed by an analysis of variance ($P < .001$).

TABLE 1
WING-LENGTH OF MALE EMERALD CUCKOOS

Area	Mean and standard error	Standard deviation	Range	Number specimens
A. Gambia-Sierra Leone	110.3 ± 0.9	1.5	109-112	3
B. Gold Coast	108.4 ± 0.9	3.1	103-114	12
C. Nigeria and Cameroons 4°-8° 30' N.	107.3 ± 2.7	7.2	101-108(114,120)	7
D. S. Cameroons	105.3 ± 0.5	2.0	102-109	16
E. (i) São Tomé	107.8 ± 2.1	4.2	102-112	4
(ii) Principe	105.7 ± 1.2	2.4	104-109	4
(ii) Fernando Po	105.3 ± 0.9	1.5	104-107	3
F. Gaboon	107.2 ± 0.9	1.9	106-110	4
G. Belgian Congo N. E. 1-4° N.	104.0 ± 0.7	2.8	101-110	17
S. 6-7° S.	104.5 ± 0.7	2.5	100-109	14
Other areas	104.3 ± 0.7	2.9	99-109	17
H. Abyssinia	107.3 ± 1.1	3.2	104-114	9
J. Kenya and Uganda	110.8 ± 0.8	3.4	105-118	17
K. Tanganyika	115.0 ± 0.6	2.0	112-118	10
L. Angola-P. E. A.	109.0 ± 1.9	5.0	102-114	7
M. South Africa	109.0 ± 0.7	2.4	105-114	13

Unlike the tails, the wings show no general north-south diminution in length. The shortest wings belong to the birds living in the most completely tropical climate, namely those of the Congo Basin forests; the longest wings are in the mountain forests of northern Tanganyika (*ca.* 2°-5° S., 3000-7000 ft. a. s. l.), the next longest those of Kenya and Uganda (about 2° S.-2° N., *ca.* 5000-7000 ft.) which, however, average significantly shorter than the Tanganyika wings ($P = < .05$). Abyssinian birds, which live at still higher altitudes and farther from the Equator, have shorter wings still (though they have the longest tails in Africa, see Table 2). Thus there is no obvious adaptation in wing-length, or regular trend in its variation.

Tail-length.—Specimens with any suspicion attaching to locality, maturity, or completeness of tail have been excluded from these statistics. In the course of our investigations it became evident, however, that immaturity of tail (not discernible by pattern or color) may be a more important disturbing factor for the present purpose than had been suspected. Specimens with the slightest sign of immaturity in the body plumage, even a single barred feather on the thighs, were listed separately. It was found that 15 of the 16 so grouped had tails shorter than the average of the population concerned—up to 15 mm.

shorter, even in birds that otherwise appeared practically adult and showed no sign of moult. It is therefore evident that the full-length adult tail is assumed after all the rest of the adult plumage, presumably in the second year, and that there are no infallible means of detecting a specimen with an immature tail. This may well account for some of the outstandingly small measurements in Table 2.

The specimens have been grouped by areas that seemed of possible significance for the present purpose and within which the population seemed fairly homogeneous. It is particularly unfortunate that from between about 6° and 22° S., covering Angola, southern Tanganyika Territory, Nyasaland, and the Rhodesias, there are so few specimens. There is also no adult male from the Anglo-Egyptian Sudan, only one female from Giggling, 6° N. The series of specimens listed therefrom by Sclater and Mackworth-Praed (*Ibis*, 1919: 645) under the heading *C. auratus* Gmel. and therefore purporting to be the species with which we are here concerned, actually are Didric Cuckoos, *C. caprius* (Bodd.). The error was corrected in 'The Ibis' (1920: 853) but unfortunately misled Chapin (1939: 203) into citing them under *C. cupreus* (Shaw).

The measurements obtained for males are shown in Table 2, the areas to which they refer being indicated on the map (Fig. 1). In order to emphasize the main size-range of each population, extremes that are five millimeters or more outside the series are shown in Table 2 in parentheses. Some time after the start of the investigation it was decided also to compare the tail-lengths of females (which are not numerous in collections). The relatively few measurements obtained are given in Table 3. The following points are evident from Tables 2 and 3.

(a) The population with the longest tails is the Abyssinian in the extreme northeast. The next longest are those on the opposite side of the continent, in the Gold Coast and extreme western Africa. The Abyssinian and Gold Coast populations, having the greatest range of length and the greatest standard deviation, are the most heterogeneous. The difference between the Abyssinian mean and the Gold Coast mean is statistically significant ($P < .05$), but that between the Gold Coast and the farther-western population is not.

Postscript.—Since the foregoing was completed we have, through the kindness of Dr. Th. Monod, Director of the Institut Français d'Afrique Noire at Dakar, been able to examine a male specimen from about 7° 40' N., 7° 40' E., in Ivory Coast, close to the Liberian border, that is, intermediate between areas A (Gambia-Liberia) and B (Gold Coast) in Table 2. The bird has spotted under tail-coverts, wing, 109, and tail, 125 which is longer than any other specimen but one

TABLE 2
TAIL-LENGTH OF MALE EMERALD CUCKOOS

	Tail-length in Millimeters				Under tail-coverts			
	Mean and standard error	Standard deviation	Range	Number specimens	Number specimens	Barred	Spotted or tipped	Plain
A. Gambia, Senegal, Liberia, and Sierra Leone	107.4 ± 2.1	4.6	101-113	5	4	2	0	2
B. Gold Coast	112.6 ± 2.7	9.0	(97.5) 103-123 (131)	11	12	8	2	2
C. S. Nigeria and N. Cameroons 4°-8° 30' N.	103.3 ± 1.9	5.9	94-108 (116)	10	5	4	1	0
D. S. Cameroons 3° N.	99.8 ± 1.2	4.7	95-109	16	11	8	0	3
E. Gulf of Guinea Islands								
São Tomé	91.0 ± 0.7	4.1	84-102	37	4	1	1	2
Príncipe	90.2 ± 1.7	4.4	84-95	7	4	0	1	3
Fernando Po	95.9 ± 2.1	4.8	88-100	5	3	0	3	0
F. Gaboon	102.4 ± 1.6	6.0	93-110 (116)	14	5	2	1	2
G. Belgian Congo	99.5 ± 0.6	4.6	90-110	60	43	31	10	2
N. E. 1°-4° N.	97.3 ± 0.8	3.8	90-106	25				
S. 4°-7° S.	101.0 ± 0.9	4.4	91-108	23				
Other areas	101.1 ± 1.5	5.2	94-110	12				
H. Abyssinia	120.7 ± 2.2	9.2	(99) 109-133	17	12	1	8	3
J. Kenya and Uganda	102.3 ± 1.0	4.6	90-111	23	21	11	7	3
K. N. Tanganyika	101.8 ± 1.5	4.8	95-111	10	7	2	5	0
Angola,			96, 98, 106	3	3	1	0	2
N. Rhodesia,			95, 5, 100	2	2	1	1	0
L. (Nyasaland, and P. E. A.	97.5 ± 1.4	4.0	93, 95, 97	3	2	2	0	0
M. South Africa	89.9 ± 4.2	4.2	83-95 (100)	22	14	14	0	0

(Gold Coast, 131) from West Africa. However, whether this specimen is included for statistical purposes in area A or area B the conclusions reached above are not affected.

TABLE 3
TAIL-LENGTH OF FEMALE EMERALD CUCKOOS

<i>Area</i>	<i>Number specimens</i>	<i>Range in millimeters</i>	<i>Mean in millimeters</i>	<i>Standard deviation</i>
Gold Coast	4	(74.5) 80-83	80.2	4.2
S. Cameroons	1	70	—	—
São Tomé	10	67-78	72.7	3.5
Príncipe	1	71	—	—
Fernando Po	3	75-78	76.6	1.5
Sudan	1	80	—	—
Abyssinia	3	85, 90, 96	90.3	5.5
N. E. Belgian Congo	10	70-79	76.1	2.9
South Africa	5	(69.5) 80	77.9	5.0

The Abyssinian females also have longer tails than do those of the Gold Coast. There is actually no overlap in range of lengths, and notwithstanding the small size of the samples the difference between the means is "significant" ($P < .05$);

(b) Between the Gold Coast and the Abyssinian population, the Nigerian-North Cameroons population intervenes geographically, with tails averaging much shorter than either (difference significant, $P < .02$);

(c) The Abyssinian population shows practically no overlap in tail-length with neighboring birds of Kenya, Uganda, and the Belgian Congo, and the differences between the means are significant ($P < .001$);

(d) South African birds have shorter tails than any others on the continent (even those immediately north of the Zambesi), and the difference between the means is significant ($P < .01$). There is, however, a slight overlap between the range of tail-length of South African and other continental populations except those of Abyssinia, Gold Coast, and farther west;

(e) Between the populations of South Cameroons, Belgian Congo, Kenya, Uganda, and northern Tanganyika respectively, together comprising a vast area, there is great overlap in ranges of tail-length and the means vary only from 97.3 to 102.4 mm.;

(f) While there is a general tendency for the longest tails to be in the north of the species' range and the shortest in the south, there is no definite cline. In fact within the Belgian Congo the mean tail-length of the northeastern specimens, 97.3 mm., is significantly less than that of the southern (Kasai), 101.0.

We can now consider to what extent the naming of subspecies within the continent is justified.

(i) It follows from (a) and (b) that several dissimilar populations are included in the generally accepted geographical range of *C. c. cupreus*, namely Gambia to Abyssinia. The name *cupreus* might at first sight be restricted to the Gambia-Gold Coast, but the type locality is Gambia, where the tail-lengths do not differ significantly from those of Nigeria and Cameroons, 4°–8° 30' N., and these latter do not differ from those immediately to the south, hitherto accepted as "*intermedius*." On the whole the birds northwest of the Gulf of Guinea are bigger than those to the south, but in the absence of any distinct trend it seems inappropriate to maintain *intermedius*.

(ii) The Abyssinian population on the other hand is statistically distinct from all others, but it has a big overlap in size-range with that of the Gold Coast. In view of this and of (b) it would be unsound either to name the Abyssinian population or to combine it with the Gold Coast population as a new subspecies.

(iii) South African birds, having shorter tails and uniformly barred under tail-coverts, show a better title to subspecific recognition than any other of the continental populations. Even from the neighboring populations on the north of the Zambesi not only are the means statistically distinct but probably 75 per cent of the individuals are separable.

(iv) On the foregoing basis it seems desirable to drop the use of *intermedius*, to use *cupreus* for all birds north of the Zambesi, even though the dissimilarity between the various populations concerned is recognized, and to retain *sharpei* for the birds on the south of it. The few specimens from about the latitude of the Zambesi River probably reflect the relative scarcity of the species there and make it easier to accept a discontinuity, but bigger collections may ultimately show a cline so smooth that no subspecific limits can be maintained.

MIGRATION

Belief in the migration of Emerald Cuckoos has been variously expressed as follows:—

Grant (1915): "breeds in South Africa and winters as far north as Gaboon and perhaps Uganda" (following Bannerman, 1912).

Slater (1924): "south of the Zambesi only from October to March."

Belcher (1930): in Nyasaland "a summer migrant September to January."

Heuglin *cit.* Reichenow (1900): in Abyssinia it arrives at 10° N. with the first of the rains (April), in fresh plumage, and leaves again in August and September.

Friedmann and Loveridge (1937) remark that "considerable care is required to distinguish birds of Tropical East Africa from wintering South African migrants." (But van Someren (1925) had previously stated that "*C. c. sharpei* does not occur in either East Africa or Uganda.")

Jackson (1938): the species "is probably a regular migrant from South Africa wintering in South Abyssinia."

Winterbottom (1939): in Northern Rhodesia "a wet season visitor only (i. e. November–March), at least for the most part."

Proof of migration requires evidence of one or more of the following phenomena: departure of birds, passage of birds (found either actually travelling or temporarily present in untypical environments), or arrival of birds. In considering this subject it is worth recalling that actual breeding records for this parasitic cuckoo are extremely rare and its full range of hosts is quite unknown; but the local breeding season of the insectivorous passerines of evergreen forest and its immediate neighborhood would certainly be a good indication of the cuckoo's.

Departure and arrival.—South Africa is regarded as the source of most migrants. It is a fact that none of the South African specimens we have examined (a large proportion of which are undated) bears a date between March and September, but it is also true that in their evergreen environment Emerald Cuckoos would be very easily overlooked when not calling. Roberts (1940) undoubtedly observes a proper caution when to the statement that there are "no winter records" (*i. e.* April–August) in South Africa he adds "but then it might be overlooked if silent." This comment applies everywhere. One of us (R. E. M.) noted them year after year at Amani, Tanganyika Territory, from the end of August to early April only, but could never feel satisfied that they were absent during the rest of the year.

In Portuguese East Africa and Nyasaland the bird is not so confined to the period September–January as Belcher thought. Benson (*unpubl.*) now has records in every month but August.

In northern Tanganyika H. F. I. Elliott (*in litt.*) has records for every month except August, with intensive calling September–April (*cf.* Amani data above).

In Kenya and Uganda there are records (mostly specimens) for every month but January and September.

In Abyssinia the Emerald Cuckoo's "season" is not so limited as Heuglin thought. There are also records and specimens for November (Stockholm Museum), December and March (Benson, 1945), so

that the months represented are March to September and also November and December.

The foregoing data may conveniently be plotted in Table 4, in which a solid line represents the period during which a parasite on insectivorous passerines is likely to be breeding (and vocal) in each of the areas (Moreau, *unpubl.*) and a dotted line indicates the other months during which Emerald Cuckoos are also reported.

TABLE 4

Area	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
South Africa (south of Zambesi)	—	—	—	—	—	—	—	—	—	—	—	—
Nyasaland	—	—	—	—	—	—	—	—	—	—	—	—
North Tanganyika Territory	—	—	—	—	—	—	—	—	—	—	—	—
Kenya and Uganda	—	—	—	—	—	—	—	—	—	—	—	—
Abyssinia	—	—	—	—	—	—	—	—	—	—	—	—

Solid lines indicate time Passeres are breeding and Cuckoo is always present. Dotted lines indicate additional months in which the Emerald Cuckoo has also been noted.

Passage records.—There appear to be no published records of this species obviously or presumably on passage, but some evidence has recently come to light.

Mrs. Koster, who has lived for some years at the semi-arid station Dodoma, in the "thorn-bush" of Ugogo, central Tanganyika Territory, and is familiar with the various African bronze cuckoos, states (*in litt.*) that the Emerald Cuckoo appears in that most unlikely area for about a month every January. This is in the local rainy season, when many of the passerines are breeding, but the Emerald Cuckoos are silent and "always very restless." They frequent particularly the station gardens and the neighborhood of the reservoir, where the vegetation is rather richer than that of the typical surrounding thorn-bush. The old Ugogo record (without date), cited by Reichenow (1902) ostensibly from Emin, is on the face of it a confirmation, but Meise states (*in litt.*) that the record seems to be due to an error on Reichenow's part.

Mr. H. F. I. Elliott reports (*in litt.*) that he has records of this cuckoo in "more or less unsuitable country" (of dry types) between Dodoma and Kilimanjaro (to the north) in December and January, but in no other months.

It seems that these birds seen in thorn-bush are not likely to belong to the Tanganyika breeding population, nor to any of those to the south. They could conceivably come from Kenya or from the Abyssinian highlands. A movement thence at that season would escape

the coldest weather, but it is known that some Emerald Cuckoos are in Abyssinia in December. Collection of some of the Tanganyika "thorn-bush" birds would help to settle the point.

The possibility that South African birds migrate to Abyssinia can be excluded. Only one Abyssinian specimen has under tail-coverts of the South African type, but it has a long tail, 127 mm.; and only one highly abnormal bird in the Abyssinian series has a tail as short as the longest South African, but it has plain under tail-coverts.

The possibility that South African birds reach Kenya or Uganda is not altogether excluded by the available specimens. Two of the 19 Kenya and Uganda specimens taken in June and July have barred under tail-coverts and have tails (91 and 94 mm.) within the South African size-range.

No one seems to have suggested a possible movement of South African birds to the Belgian Congo, but the Tervuren series contains six specimens, collected in May and September in several different localities, which have barred under tail-coverts and tails measuring 91, 95, 97, 98, 99, and 100 mm. The size-range of South African birds given in Table 2 shows that only the first of these is at all likely to have come from there.

CONCLUSION

One outcome of this investigation, using more material than hitherto, is to stress the need for caution in naming subspecies mainly on the basis of measurements. The Emerald Cuckoo provides an example of ill-defined and apparently nonadaptive variation, mainly within an ancient continent. It provides, moreover, several instances in which most individuals of two different populations are indistinguishable but in which the means of the populations differ to an extent that is statistically significant. To such populations subspecific names cannot be applied; to use one subspecific name to cover populations known to differ slightly is the only alternative and is the lesser evil.

SUMMARY

The characters of the Emerald Cuckoo available for taxonomic purposes are limited to the pattern of the outer tail-feathers, coloration of the under tail-coverts, length of tail, and length of wings. The last two show certain geographical variations of statistical significance, but barring or spotting of the under tail-coverts is not so diagnostic as was formerly believed.

The cuckoos of S o Tomé and Príncipe are described as *C. c. insularum*, on pattern of outer tail-feathers.

Tails tend to be longest in the north, especially in Abyssinia, shortest in South Africa (and on the Guinea Islands). Between most populations there is extensive overlap in range of length, but at the same time the means of some populations differ significantly. From one point of view the range of *C. cupreus cupreus* as at present accepted is too wide because it includes heterogeneous populations; on the other hand, further subspecific division is not desirable. *C. c. intermedius* should be dropped, *C. c. cupreus* extended to the Zambesi, and *C. c. sharpei* retained.

Wing-length varies less than tail-length but the birds of northern Tanganyika and of Kenya-Uganda have (in that order) the longest wings and those of the Congo Basin the shortest.

The extent of migration is still obscure. Specimens give no support to the view that South African birds migrate to Abyssinia, but specimens indistinguishable from South African ones occur in Kenya and the Belgian Congo in the South African non-breeding season. Emerald Cuckoos migrate through central Tanganyika in January but that is the "wrong" date for South African migrants.

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NOTES ON THE SONG SERIES OF A HERMIT THRUSH IN THE YUKON

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A Hermit Thrush, *Hylocichla guttata*, sang in the forest-edge near our camp beside the Teslin river at a point called Johnson's Crossing, Yukon Territory. I listened to its singing whenever possible during the latter half of June, the whole of July, and the first part of August, 1948.

The thrush was a singer of the twilight hours and might be heard for several hours in the evening and early morning and also at other times on cloudy days. Sometimes it sang at so great a distance that the songs were heard only faintly. At other times it sang near by, and the songs were loud and clear. I rarely heard it as late as 11 p. m., although the Olive-backed Thrush sang at midnight. Ordinarily the last song of the Hermit was heard before 10:30 p. m. The singing was often heard about 1:00 a. m. and continued until about 6:00 a. m.