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FURTHER DATA ON AFRICAN PARASITIC CUCKOOS

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The data assembled in this paper extend our knowledge of African parasitic cuckoos from the basic facts presented in my book entitled "The Parasitic Cuckoos of Africa" published in 1949 and the little addendum to it (Friedmann, 1949b) published later in the same year. In the present account only those data pertinent to the problems of parasitic reproduction are included. For this reason, some species of cuckoos are not discussed at all as there were no new facts to describe. Even in those that are treated in this paper almost no space is given to such items as call-notes, migration, food of the adult, plumages, etc.

For sending me unpublished information, for answering many queries, and for other acts of kind cooperation, I am indebted to the following naturalists: C. F. Belcher, J. P. Chapin, F. Haverschmidt, R. Liversidge, P. Millstein, E. Pike, O. P. M. Prozesky, R. A. Reed, and W. Stanford. The photographs illustrating this paper were supplied by Mr. Liversidge in addition to his information. His observations on the red-chested cuckoo (Liversidge, 1955), unpublished when sent to me, fortunately appeared in print just as the present manuscript was about to leave my hands. I have therefore merely summarized his data insofar as integrating all the information has permitted.

Clamator glandarius (Linnaeus)

Great-spotted cuckoo

Three new hosts may be added to those listed in my book, one of which is only a race of a species of which another form was already recorded as a victim of the great-spotted cuckoo. The first of these is the dwarf raven (*Corvus corax ediihae*), a bird of which Belcher (1949a, p. 37) records a nest found near Gabredarre, Ogaden, Italian Somaliland, containing three or four eggs of the great-spotted cuckoo and three or four eggs as well as one young of the host. Previously only the Spanish race of this raven (*C. c. hispanus*) had been reported as a host of the nominate race of the cuckoo.

The second is the piapiac (*Ptilostomus afer*). I have no data on this other than that it is mentioned as a victim of the great-spotted cuckoo by Mackworth-Praed and Grant (1952, p. 505).

The third new host is the long-tailed glossy starling (*Lamprotornis caudatus*). Madden (1934, p. 94) saw a fledgling great-spotted cuckoo apparently being fed by a pair of these starlings at El Obeid, Kordofan, Sudan, in November 1932. Aside from adding an additional species to the known hosts of this parasite, this record seems to be the first for any hole-nesting bird north of South Africa. As pointed out in my book (Friedmann, 1949a, p. 10), the data then available showed a puzzling divergence in the choice of victims by this cuckoo in South Africa on the one hand, and everywhere else in its range on the other. In the former area most of the records were of hole-nesting birds (three species of starlings), while all the records from Nyasaland and Southern Rhodesia north to the Mediterranean lands were of birds making open nests in trees or on ledges (crows and magpies of several species). It is true that one open-nest builder, the Cape rook, was known to be parasitized in South Africa; now we may further reduce the apparent geographical disparity in host selection with this indication of the choice of a hole-nesting victim as far north as the Sudan.

In my earlier report (Friedmann, 1949a) I considered all the populations of the great-spotted cuckoo as one taxonomic unit. Since then, Clancey (1951, p. 141) has separated the birds south of the Sahara under the name *choragium*, restricting the name *glandarius* to the birds that breed in Spain, Portugal, Mediterranean Africa, Cyprus, Greece, Asia Minor, and Iran and that migrate south in winter to tropical Africa. It follows from this that there again seems to be a regional difference in host selection. The nominate race is known to utilize only open nests, chiefly of corvids of several kinds, whereas the African *choragium* lays in such nests and in those of hole-nesting starlings as well.

Clamator jacobinus (Boddaert)

Jacobin cuckoo

New information gathered on the jacobin cuckoo does more than merely yield additional instances of its parasitism on previously recorded hosts. Many additional records of its eggs in nests of Layard's bulbuls (*Pyenonotus tricolor layardi*), sombre bulbuls (*Andropadus importunus importunus*), and fiscal shrikes (*Lanius collaris collaris*) corroborate the predominance these hosts play in the economy of the parasite, but, merely as records, they add no revealing new data. Two additional instances of the bakkabiki (*Telephonus zeylonus*) added to the three listed in my book suggest that this shrike is more frequently victimized than was formerly suspected. These instances are: (1) a nest found at Butterworth, Cape Province, by Pike on February 4 with one egg of the host and one of the parasite, and (2) a case reported by A. W. Vincent (1949, p. 138) from Richmond, Natal.

Two new host species may be recorded. Skead (1954, p. 46) reports that an egg of this cuckoo was found in a nest of the paradise flycatcher (*Terpsiphone viridis perspicillata*) at Fleet Ditch Kloof, near King William's Town, eastern Cape Province, on Dec. 18, 1954. In the Victoria Memorial Museum at Salisbury in 1951 I found a set of two eggs of the grassbird (*Sphenoeacus afer transvaalensis*) with one egg of the jacobin cuckoo, taken at Inyangas, Southern Rhodesia (no date), by Flight Lt. E. F. Allen. This is not only a record of a new host but also is the only instance known to me of the parasite using a nest built close to the ground. The one record of the jacobin parasitizing a kingfisher, described in my book (Friedmann, 1949a, p. 31), may well be questioned; it may have been a honey-guide's egg.

In my earlier account (Friedmann, 1949a, p. 36) of the hosts of this parasite I raised some doubts as to two cases recorded by de Klerk of the jacobin cuckoo laying its eggs in nests of the yellow-throated sparrow (*Petronia superciliaris*) and suggested that the records might refer to honey-guides. However, de Klerk's measurements are too large for any honey-guide's eggs and agree very closely with other, authentic eggs of the jacobin cuckoo. The records must therefore be accepted, but it remains that the host is a very unusual one, nesting, as it does, in holes in trees, a type of nesting site not otherwise known to be utilized by the jacobin cuckoo.

INCUBATION PERIOD

The incubation period is still to be determined, but Skead's (1951, pp. 171–172) incomplete evidence suggests a shorter period than did my own similarly fractional data (Friedmann, 1949a, p. 37). It may

be recalled that the nest I was watching was destroyed 14 days after the last host's egg was laid and the smashed cuckoo's egg in the nest seemed then about in hatching condition. One of Skead's cases suggested a possible incubation period of 12½ days, while his second one seemed three days less, and caused him to ask if the cuckoo's egg might begin its development some time prior to ovulation. It would seem unlikely that the incubation period is under 12½ days.

EVICTING HABIT

Our knowledge of the evicting habit in the jacobin cuckoo still requires clarification. In 1949 (Friedmann, 1949a, p. 37) I was aware of no real evidence and could only conclude that while the young cuckoo was almost always the sole survivor of a nest, the absence of any of the rightful young might be the result of their failure to compete for food with their parasitic nest-mate rather than that they were actually evicted alive by it. Skead (1951, pp. 172–173) has described an instance in which the nestling jacobin tolerated eggs and young in the nest for up to four days, and another in which it made no attempt to evict eggs for four days but in which a chick of the host was found to disappear within less than a day after hatching (but not necessarily evicted by the cuckoo). In the first case, Skead comments that, considering how the young cuckoo covered and almost suffocated its nest-mate (a Layard's bulbul), the "possibility of death of nestlings by this means must not be ruled out. The chick was so weak . . . when retrieved . . . that had it remained there much longer, it would have been smothered. Therefore, I wish to draw attention to the suffocation of cuckoo's nest-mates and the possibility of their subsequent removal by the foster-parents during nest-sani-tation"

In this connection, an observation by Pike recorded by Godfrey (1939, p. 23) and inadvertently overlooked in my earlier report is of interest. At Butterworth, Transkei, Cape Province, he found a nest of a fiscal shrike on January 15 containing only one egg—a jacobin cuckoo's. On February 27 the nest was revisited and was found to hold a young jacobin and three young shrikes. Still later he saw the four young birds perched on twigs near the nest, and still later he noted that the young shrikes had left but the cuckoo was still being fed by an adult shrike. This is the only definite instance known to me of the nest-mates surviving together with a jacobin cuckoo. From this, and from the two instances described by Skead, in which eviction by the cuckoo, if any took place, did not occur for some days after hatching, it follows that evicting is certainly not invariable or immediate, and, for that matter, it is still not possible to say that the young parasite was responsible for any evictions.

Actually, this is not surprising when we consider that in the related great-spotted cuckoo, the rightful young often, and perhaps even regularly, grow up together with the parasite. Furthermore, two young jacobin cuckoos have been noted as growing up together with one of the young of a babbler host (*Argya malcomli*) in India, a further indication of the lack of evicting behavior (Bates, 1938, p. 125).

EGG LAYING

Pike (again cited in Godfrey, 1939) found, on December 4, another nest of the fiscal shrike containing one egg of the jacobin cuckoo; two days later it contained two shrike's eggs in addition to the cuckoo's, and three days later still it held five eggs of the shrike and the one egg of the jacobin. Pike was unable to visit the nest again. It would appear from this case and the one referred to previously that the cuckoo may lay occasionally into nests before the builder has begun to lay. It is, of course, not impossible that in each instance there may have been a single shrike's egg present and that the cuckoo removed it when laying its own. It is, however, not very likely that this was the case, as the usual number of eggs in a clutch of the shrike is four or five, and in these cases there was no reduction as would have been the case had the cuckoo removed an egg. In my earlier account of this parasite (Friedmann, 1949a, p. 30) I summarized the then available information on this point, and I have seen no evidence to cause me to change it since: "No one has witnessed the actual deposition of the egg, but judging by the fact that the number of eggs of the host is usually less than the full complement by the number of cuckoos' eggs in the nest, it seems that the cuckoo usually removes an egg before laying into the nest" Of course, if—as seems to have been the case in the two instances described above—the cuckoo's egg is laid first there can be no such removal of a host's egg.

An observation suggesting that the jacobin cuckoo may at times be an egg-eating nest robber is the following sent me by Pike, who once saw some red bishop birds (*Euplectes orix*) chasing one of these cuckoos away from their nests. Two of the nests each had a hole of about an inch and a half in diameter torn in the lower part; one of the nests contained two eggs of the builder, one being badly pecked and empty and the other also broken; the bottom of the nest was moist with spilled yolk.

In my earlier account of this cuckoo (Friedmann, 1949a, p. 30) it was mentioned that only a single instance was known in Africa of more than two eggs of this bird in one nest, although in India Stuart Baker had recorded six nests with three eggs of the parasite apiece, two nests with four, and one nest with six eggs attributable to the jacobin cuckoo. The lone African instance was a nest of the sombre

bulbul (*Andropadus importunus*) with five eggs of the cuckoo and two of the host, reported by Ivy (1901, pp. 23-24). It was to be expected that the situation in the African population of this cuckoo would prove to be similar to that in the Asiatic part, and this has recently been found to be the case. Mr. H. M. Miles of Salisbury, Southern Rhodesia, informs me (in litt.) that nearby, at Plumtree School, on Mar. 2, 1954, Mr. Ian Cannell found a nest of Layard's bulbul containing seven eggs of the cuckoo and one broken egg of the bulbul. He also found another nest of the same host with four eggs of the cuckoo and one egg of the bulbul.

***Clamator levaillantii* (Swainson)**

Stripe-breasted cuckoo

Recently in South Africa, Milstein (1954, pp. 4-5) produced evidence indicating that this cuckoo may lay pure white eggs as well as the greenish blue and pinkish ones described in my book. The case is as follows. He saw two stripe-breasted cuckoos perching in a wild fig tree in which there was a nest of a yellow-vented bulbul. The cuckoos repeatedly hopped towards the nest and the bulbuls kept them at bay, diving onto their backs, gripping, and literally riding them to the ground. The intruders, fluttering wildly, never retaliated even when one of the bulbuls yanked out a tuft of whitish breast feathers from one of the cuckoos. Milstein watched this repeated attack and counterattack for over an hour and a half. He then left, but returned several hours later when he examined the bulbul's nest for the first time. It contained two eggs of the bulbul and four large white eggs, presumably of a cuckoo. The two bulbul eggs and three of the parasitic eggs were snugly settled in the nest, but the fourth white egg, slightly pinkish (freshest?) was on the rim of the nest, almost falling out. Milstein was inclined to assume that the fresh egg had been laid during his absence by one of the stripe-breasted cuckoos that had shown so much interest in the nest a few hours earlier. The four white eggs measured, in millimeters, as follows: 27×22.25 , 26.6×21 , 26.25×21.5 , and 25.25×20.75 . In this respect they agree with known eggs of both the stripe-breasted cuckoo and the pied cuckoo; in color they agree with authentic eggs of the latter. It is to be hoped that further observations, including allowing such eggs to hatch and develop into diagnostically feathered chicks, may be forthcoming.

To the still meager data on the breeding season of this cuckoo in various parts of its range may be added the fact that Verheyen (1953, pp. 305-306) records that it breeds during the rainy season in the Upemba Park, Belgian Congo, where males with swollen gonads were collected on October 7 and March 15.

Cuculus canorus gularis Stephens

African yellow-billed cuckoo

Information about this bird accumulates very slowly; however, it is possible to add a new species to the small list of its known hosts. Mr. H. M. Miles, of Salisbury, writes me that a correspondent of his, J. R. Peters, found a nest of Layard's bulbul (*Pycnonotus tricolor layardi*) containing a young yellow-billed cuckoo on Oct. 9, 1955, at a spot called Guinea Fowl, 12 miles southeast of Gwelo, Southern Rhodesia. At that time the nest contained two newly hatched bulbuls as well as the young cuckoo. Ten days later the nest was revisited and was found to hold only the young parasite. It was at this visit that the young cuckoo, then well feathered, was identified as *Cuculus canorus gularis*.

Neuby-Varty (1950, p. 38) found the gray-headed sparrow (*Passer griseus diffusus*) to be victimized in Southern Rhodesia. At his farm "Torre," near Marandellas (no date given), he found a nest of this sparrow in a natural hole in a sugarbush containing two eggs of the sparrow and one of the African yellow-billed cuckoo. The egg of the latter was very light bluish gray with blotches of slate and dark greenish olive brown, mostly at the thick end but also scattered over the rest of the egg, and measured 23.5 × 16 mm. This agrees very well with the fully authenticated oviduct egg described by the same observer (Neuby-Varty, 1948, p. 158) two years earlier. This record is the first indication that this cuckoo lays in nests in holes in trees, the few previous records involving open nests in exposed situations.

In the Victoria Memorial Museum, Salisbury, is an egg, supposedly of this cuckoo, collected by D. Townley at Rumani, Southern Rhodesia, Dec. 20, 1929, from a nest of an unidentified babbler. The label on the egg bears the words "identity sure," and the egg is not unlike authentic ones of this cuckoo. No babbler has yet been recorded as a victim of this bird, but this case must remain unidentified.

Cuculus solitarius Stephens

Red-chested cuckoo

PLATES 1-3

Our knowledge of several phases of the life history of this cuckoo has increased greatly in the past few years. For easier reference and discussion these data may be treated under various subheadings.

EGGS AND EGG LAYING

When compiling the data for my book I was unable to find an instance of more than one egg of this cuckoo in any single nest. Tait (1952, p. 135) has since recorded such a case—a nest of *Cossypha*

caffra drakensbergi with one egg of the host and two of the cuckoo. The cuckoo eggs were sufficiently dissimilar in color to suggest that they were laid by different hens. There is, as yet, no evidence to indicate that the same cuckoo may lay more than one egg in a nest.

While it is true, as stated in my book (Friedmann, 1949a, pp. 68-69), that the great majority of the known eggs of the red-chested cuckoo are plain pale chocolate brown or olive brown without any markings, a sufficient number of divergent types since have been recorded from southern Africa to make it seem that there is more variation than was formerly apparent. Thus, in the Bryanston district, near Johannesburg, Transvaal, Reed (in litt.) found a red-chested cuckoo's egg in a nest of a Cape robin-chat together with one egg of the owner, which it closely resembled, being olive green in color and heavily blotched with reddish brown, the blotches forming an almost solid mass at the obtuse end of the egg. In another nest of the same host species he found another egg of this cuckoo (identity certain because the egg was allowed to hatch and the development of the chick followed in detail). This egg has a fawn colored ground and was heavily blotched with dark reddish brown. Still another parasitized nest of the Cape robin-chat was found containing an egg that presumably was of this cuckoo. It was "off white" in color and very heavily speckled with large, dark brown spots.¹ That three such divergent, blotched or spotted eggs were found in one locality seems to eliminate, or to render doubtful, the possibility of their being unusual or pathological in any sense. Still another color variant has recently been described in Northern Rhodesia by Haydock (1950, pp. 149-150) as deep cream in color and with a very rough shell texture.

So few observations are available on the question of whether or not the hen cuckoo removes an egg of the host when depositing one of its own that the following case, incomplete as it is, is of some interest. Liversidge (in litt.) writes me of a parasitized nest of a Cape robin-chat, a bird whose name occurs under several headings in our present discussion. The nest was found by the observer's landlady, who was certain that one day the nest was empty and the next day it contained an egg of the cuckoo and one of the host. This would suggest that the cuckoo laid the same day as the robin-chat and did not remove an egg at that time. It is, of course, not impossible that the cuckoo may have laid its egg earlier in the day than did the host, and that there was no egg for it to remove. As I have recorded previously (Friedmann, 1949a, pp. 69-70), the red-chested cuckoo seems to lay not infrequently in nests before the host has

¹ This egg is not dissimilar to known eggs of *Cuculus cafer*; the possibility cannot be ruled out that the egg may have been of the black cuckoo.

begun laying. In at least one instance where the cuckoo laid in a nest already containing eggs of the host, it did remove one of them when depositing its own.

INCUBATION PERIOD

The nest of a Cape robin-chat studied by Liversidge, mentioned above, yields the following information on this topic. The person who first showed him the nest was quite definite that the eggs (one each of the cuckoo and the host) were first present on September 21 (about a week before Liversidge first saw the nest). The cuckoo's egg hatched on October 7, which implies that at least 16 days elapsed between the time the egg was laid and the date of hatching. It is not known, however, if the host began to incubate on or immediately after September 21; but at least it is clear that no eggs were laid in the nest subsequent to the two seen on September 21, and it would seem that incubation may well have started on or just after the date of laying. This account leaves much to be desired, but it suggests an incubation period somewhat longer than the one of 12½ days reported for the related European cuckoo, *Cuculus canorus*. More accurate data are needed to clarify this point.

HOST RECORDS

Accumulation of many additional host records indicates even more strongly than before that the robin-chat *Cossypha caffra* is the chief victim of the red-chested cuckoo wherever the two occur together. At least three subspecies of the *Cossypha* are now known to be parasitized: the nominate one, for which I had numerous records previously and for which I could add at least as many new ones now; the tropical race *iolaema*, earlier listed on the basis of a single instance to which several more may now be added (Wiley, 1948, p. 2); and the subspecies *drakensbergi*, recently found to be victimized at Underberg, Natal, by Tait (1952, p. 135).

The Natal robin-chat was previously listed as a host of the red-chested cuckoo solely on the strength of Roberts (1939, p. 8), who lists it in this capacity. No specific records or other data were given by him. Recently Mr. H. M. Miles has informed me that at Melsetter, Southern Rhodesia, a correspondent of his saw a fledgling of this cuckoo attended by a Natal robin-chat. There is nothing unexpected about this record, but it is a welcome additional indication to the not too informative statement given by Roberts.

One species has been added to the list of known hosts by Haydock (1950, pp. 149–150) at Luanshya, Northern Rhodesia. This is another species of robin-chat, *Cossypha heuglini*, in a nest of which he found, on October 22, two eggs of the owner. An hour later a red-

chedested cuckoo was heard calling near the nest. It was perched on a small branch nearby. One of the chats was standing on the edge of the nest in a threatening attitude. The next morning the nest contained one of the original eggs and another much larger one that measured 25.7×18.2 mm. It was ovate, deep cream in color, and had a very rough shell texture. A week later the nest was found to be empty when revisited. Benson (1951, p. 98) found another parasitized nest of this robin-chat at Ketete, Nyasaland, on September 22. It contained one egg of the host and one of the cuckoo. Near Marandellas, Southern Rhodesia, Neuby-Varty has reported seeing a young fledgling red-chested cuckoo with a Heuglin's robin-chat, according to information received from Mr. Miles.

Haydock (1950, pp. 149-150) records the following observation suggestive of the possible utilization of a hole-nesting host, a starling, by the red-chested cuckoo. He writes that on Dec. 17, 1948, a pair of *Lamprocolius* sp. were seen feeding a young cuckoo recently out of the nest. On close inspection (the bird was caught) the latter appeared to be a red-chested cuckoo chick, having "the typical yellow legs and feet, and differing from *C. gularis* in being practically a uniform black, though there were some traces of rufous on the thighs and marginal tail feathers, and odd feathers of the breast were tipped with a dirty white" The identification of the starling fosterer was impossible as the birds were not collected, but Haydock was inclined to feel that the species probably was *Lamprocolius chloropterus elizabeth*, a form previously known to be nesting in the area.

Aside from the uncertainty as to the species of starling involved, the evidence is not sufficiently conclusive to enable us to add it (even as *Lamprocolius* sp.) to the list of birds definitely recorded as hosts of this parasite. Merely seeing a bird feeding a fledged cuckoo is not necessarily proof that it raised the latter. In this connection, it may be pointed out that Harding (1948, p. 2) saw a young red-chested cuckoo, out of the nest, being fed by a Fischer's slaty flycatcher (*Dioptrornis fischeri*). The next day he observed the same cuckoo being fed by a pair of collared sunbirds (*Anthreptes collaris*).

In their recent book, Mackworth-Praed and Grant (1955, pp. 318-319) write that the white-winged scrub-robin (*Erythropygia leucophrys leucophrys*) is a common victim of the red-chested cuckoo. Just what data or how many actual instances of parasitism were known to these authors is, unfortunately, not stated. In my earlier account I listed but a single record under the name *Erythropygia leucophrys brunneiceps*. This refers to the same bird, although it may be pointed out that Mackworth-Praed and Grant use the name *brunneiceps* now for a race of *Erythropygia zambesiana*, a species not yet found to be imposed upon by the red-chested cuckoo.

The Cape wagtail (*Motacilla capensis*) was previously listed as a host of the red-chested cuckoo on the basis of two records. To these may be added two more, a nest found in the Transkei, Cape Province, containing one egg of the cuckoo (E. Pike, in litt.), and a nest of the race *Motacillo capensis wellsi* with three eggs of the wagtail and one of the cuckoo found at Kabete, Kenya Colony, Apr. 26, 1944, by Wiley (1948, p. 2).

A second record of the dusky flycatcher (*Alseonax adustus*) as a victim of this cuckoo comes to me from Walter Stanford (in litt.). On Dec. 22, 1952, at Deep Gat, Somerset West, Cape Province, he found a nest of this flycatcher containing one egg of its own and one egg of the red-chested cuckoo. The nest was built in a little recessed hollow in a tree trunk. On revisiting the nest two weeks later, Stanford found that the cuckoo's eggs had not hatched, while the flycatcher's egg had done so and the young *Alseonax* was well feathered.

A host overlooked when compiling my earlier account is the Cape sparrow (*Passer melanurus melanurus*). C. J. Bergh (1942, p. 99) writes from Belfast, Transvaal, that he has known the red-chested cuckoo to lay its eggs in a "mossie's nest." The name "mossie" is loosely used for several species of sparrows but is usually intended to refer to the Cape sparrow.

EVICTING INSTINCT

Considering the complete absence of any information on this topic up to the time of the completion of my 1949 book, and, indeed, the amount of evidence suggestive of the lack of such behavior, it is gratifying that a number of detailed pertinent observations have since been made. There can no longer be any doubt that the evicting of nest-mates is commonly, perhaps regularly, done by newly hatched red-chested cuckoos, but it still seems necessary to qualify this with the statement that it seems to be less universal in this species than in the European cuckoo. In the latter bird it is extremely rare to find the young cuckoo tolerating any nest-mates.

Aside from Pringle's account, which I have briefly described (Friedmann, 1949b, p. 515), I now have data on three more instances, all in nests of the Cape robin-chat (*Cossypha caffra*). Reed (1952, pp. 14–15) has described one such instance, and has kindly supplied me with fuller details, which are given here as they constitute a better record of events than his condensed printed one.

On Dec. 25, 1951, near Johannesburg, Reed discovered a nest of the robin-chat with three eggs, one of which was a red-chested cuckoo's. The nest was kept under close observation, and on the morning of January 1 he found that the cuckoo's egg had hatched but that the robin's eggs were still intact in the nest. By 7 a. m. of January 3

both robin eggs had been ejected from the nest. One lay on the ground at the base of the tree and the other lay in a fork of the tree beside the nest. Fortunately, neither egg was visibly damaged. Reed replaced one egg in the nest with the cuckoo chick and watched the bird try immediately to eject it. However, when the chick had gone through the performance of carrying the egg on its back to the edge of the nest and the egg had rolled back into the nest, Reed removed it. He repeated the experiment on January 4 with the same result, but when he tried again on January 5 he was unable to induce the chick to attempt to eject the egg. To make quite certain that the bird had lost all desire to eject it, he placed the egg on its back, but the chick lay passively and made no attempt even to remove it. Reed then broke both robin-chat eggs and found no sign of incubation in them.

Another nest was found by the same observer on November 29. It contained a newly hatched cuckoo and a robin-chat's egg. On December 2 the host's egg was found lying on the ground just below the nest. Reed replaced this egg in the nest two days later, but not even putting it directly on the back of the chick would induce the latter to attempt to evict it. The young cuckoo was at least 6 days old at that time; therefore, this case agrees with the more fully described one in that the instinct to eject the nest-mates was found to disappear before that age.

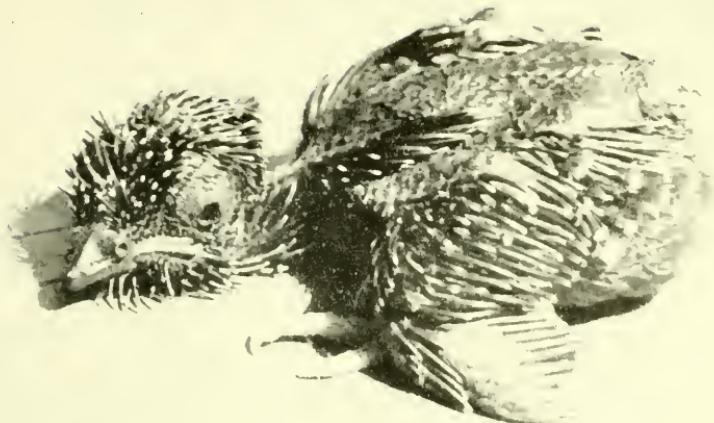
Near Cape Town, Liversidge (in litt.) watched a nest of a Cape robin-chat containing one egg of the cuckoo and one of the host and made detailed notes. (Also, he kindly supplied the photographs for use in this paper.) The cuckoo egg hatched, and within 24 hours the host's egg was out of the nest. Liversidge put it back, but a few hours later, when Dr. Broekhuysen visited the nest, it was out again. The lady in whose garden the nest was located was asked to keep up observations, to replace the egg in the nest each time, and to see how often the young cuckoo would evict the egg. After three more evictions in 10 minutes, the observer lost some of her attentiveness but reported that the chick threw out the egg many more times that day, the total of such evictions being in excess of 25 by the time the observations were called off. The chick was later given eggs of various sizes and shapes, and even small stones, all of which it evicted, or, at least, attempted to eject. This went on until its fourth day. On the fifth day an egg, when placed in the nest, was allowed to remain there, but the ejection movements of the young cuckoo could still be induced by prodding its back. Liversidge writes that the chick did not have any hollow space on its back, which was quite broad and flat. When ejecting an object, however, the back becomes slightly concave, as in the case of the well known European species, *Cuculus canorus*.



Cape robin-chat bringing food to a young red-chested cuckoo in its nest.
(Photo by Liversidge.)



One-day-old red-chested cuckoo ejecting host's egg from nest. Sequence: left to right top to bottom. (Photos by Liversidge.)



Growth of young red-chested cuckoo. *Top:* 3 days old; first feathers breaking out of their sheaths. *Bottom:* 19 days old; one day before leaving the nest. (Photos by Liversidge.)

THE NESTLING AND ITS DEVELOPMENT

When I wrote my earlier account of this cuckoo there were almost no data on the growth and development of the young bird in the nest. Within the next year Hughes (1949, pp. 2-4) filled in part of this gap in our knowledge, while Liversidge (1955) has since filled a good deal more. In addition to these data, there are available some observations kindly supplied me by R. A. Reed. It is from these three combined sources that the following description is compiled.

To begin with the more important items: The duration of the nestling stage (i. e., from the time of hatching to leaving the nest) of this cuckoo in nests of the Cape robin-chat was found by Reed to be from $17\frac{1}{2}$ to 19 days, by Liversidge to be 20 days \pm 6 hours, while in the nest watched by Hughes the young cuckoo was found to have been killed by a predator in the nest on its 20th day; one leg, severed from the body, was all that remained. The nestling period for the related European cuckoo, *Cuculus canorus*, is 20 days, agreeing with the data for the present species.

On hatching, the young cuckoo is devoid of down and is very dark all over. According to Hughes it is shining black; Reed describes it as dark bluish black; and Liversidge records it as brown, changing within the next two days to purplish brown. The gape at first is yellowish orange with yellowish edges, but becomes wholly bright orange by the end of the second day. The bill is dark horn color with a whitish egg-tooth; the feet are dark flesh color. Liversidge found a day-old chick to weigh 4.9 grams.

On the fourth day the quill-like, stiff feather sheaths appear on the upper surface of the wings. The next day these sheaths are 3 mm. long and show some black pigment basally; on this day sheaths first appear on the cervical tract. On the sixth day the skin over the eyes begins to open, but only slightly, hardly enough to enable the bird to see. On this day the sheaths begin to show up on the chin, forehead, and sides of the breast, flanks, and abdomen, the longest ones are twice as long as they were on the fifth day, 6 to 7 mm. By the seventh day the cuckoo, now more than four times its natal weight, shows the first sprouting of feathers out of the sheaths on the wings and tail according to Hughes; Liversidge reports this as taking place on the eighth day, and notes that the feathers are grayish with a white terminal bar. On this day sprouting also begins on the sides of the breast, and by the end of the ninth day this condition extends along the entire ventral tract.

On the 10th day the eyes fully open, a most important change in the development and behavior of the chick. The rest of the plumage breaks from the enclosing sheaths on this day and the next and the bird suddenly becomes quite fluffy, a marked change in appearance.

On the 11th day the bird begins to ruffle its plumage, a type of movement not indulged in hitherto. The feathers, now all out of the sheaths, become darker, more pronouncedly blackish and less grayish due to the increased area of their newly freed portions. The ventral edge of the bend of the wing is white, the alula is black, and the under primary coverts are black with white bars; the feathers of the breast and sides of the abdomen are light buff with a black subterminal and a broad buff terminal bar; the feathers of the midabdomen and thighs are paler. On the 12th day the rectrices show the contrasting white tips very markedly because of the growth of the dark proximal portion of the feathers. By this day, or, in one case, even two days earlier, the young cuckoo has grown so that it completely fills the nest.

On the 15th day the remiges and rectrices are noticeably longer than the rest of the plumage. From this stage on until the chick leaves the nest, the changes are only matters of rapid growth. The feet are now yellow, whereas originally they were flesh colored.

By the time it leaves the nest the cuckoo has grown in weight more than 11 times its hatching size. Liversidge's bird weighed 4.9 grams at birth and nearly 60 grams when it left the nest.

Aside from the purely physical development of the bird, as outlined above, Liversidge has put on record some highly interesting observations of the growth and change of its behavior. For the first five days, as noted in our discussion of the evicting instinct, the chick reacts to nest-mates (eggs or other chicks) by getting them on its back and pushing them out of the nest. This reaction is very weak on the first day, very strong on the second, and normally ceases on the fourth day, but it can still be evoked by artificial stimulation on the fifth day. During this period the gaping response of the chick is usually straight up in direction.

A second stage begins with the parting of the skin over the eyes. Gaping is now directed toward the entrance of the nest, i. e., toward the direction of the light, rather than merely upwards, and may be induced by either touching and slightly jarring the nest or by a sharp whistled sound near the nest. Liversidge, however, considers that this directional gaping is more the result of an originally conditioned stimulus than of a visually oriented one. The location of the nest necessitated the same approach by the foster parents when visiting it, and gaping became directed toward the entrance. It is true, however, that the gaping did become more directional at the time the eyes began to open, even though the first day or so they were not open enough to give the chick really effective or efficient vision. Both Liversidge and Reed observed the first threatening reactions on the eighth or ninth days. Reed noted that the chick erected the feathers of the head and neck and opened the bill, revealing the

bright orange gape. On a closer approach, the bird reacted by darting its bill forward to strike the hand that was extended toward it, an action much more aggressive than any feeding behavior. Liversidge found that on the eighth day the eyes were open slightly early in the morning but were closed again in the evening. It was not until the 10th day that the bird seemed able to make full and continuous use of its eyes; on this day the chick first reacted to movements of his hand. This, it may be noted, is a little later than in Reed's experience, and may reflect the range of individual variation in the rate of this stage of the development.

The first noise uttered by the chick, according to Liversidge, was heard on the 10th day, a quiet, chattering note. The next day this note, now much louder, was used apparently only in connection with begging for food. The original gaping reaction given in response to touching the nest continued up to the 11th day, but by the evening of the 12th day such stimulation only elicited threatening reactions.

The period from the 15th day of nestling life onward to the time the chick is fledged and leaves the nest is characterized by a greater variety of activities. The bird first begins to preen on the 15th day, at first in a haphazard, apparently nonfunctional way, but rapidly becoming fully functional. On this day the nestling was first seen trying to stand up, unsuccessfully at first, but soon becoming better at it. On the 18th day Liversidge's bird first practiced stretching its wings, and from then on it quivered its wings whenever begging for food or being fed. On this day, also, it first seemed to distinguish the call of the foster parents, but showed no ability to differentiate between the various notes given by the robin-chats while at the nest. Reed observed that when the young cuckoo had left the nest it apparently was able to distinguish the alarm note and to react accordingly.

We still know very little about the postnestling stage of the young cuckoo's development, the stage when it becomes separated from the care of its host and becomes self-sufficient. Reed banded a young red-chested cuckoo before it left the nest of its foster parents and found it being fed by them as much as 13 days after it left the nest. It continued to remain within a radius of 50 yards of the nest for at least a month, after which it was seen no more.

Stanford (in litt.) watched a pair of Cape robin-chats feeding a young red-chested cuckoo some days out of the nest. He first found the latter by hearing its low-pitched but incessant "tsip-tsip-tsip" notes. When the robin-chats came close to it, the bird's calling increased in intensity; the young cuckoo bent forward, opened its bill, partly opened and drooped its wings and ruffled its plumage. The call became much louder and was repeated more frequently, the bill opening and closing spasmodically all the while. Once the bird

had been fed it calmed down promptly. He saw it fed eight times in 30 minutes, mostly on what seemed to be grubs, spiders, and grasshoppers.

BREEDING RANGE

The first indication that the red-chested cuckoo may breed in West Africa is a record of a female with a well yolked egg in the ovary collected on August 6 at Lake Bambalue, near Bamenda, British Cameroons (Bannerman, 1951, p. 274).

Cuculus cafer Lichtenstein

Black cuckoo

Since the publication of my earlier account of this rather shy and secretive cuckoo, additional data, especially on the development of the nestling and, to a lesser extent, on the evicting habit, have been recorded. This is principally due to Skead's (1951, pp. 163-168) observations. In his area in the eastern Cape Province he found the boubou shrike (*Laniarius ferrugineus*) to be the regular, and, as far as his own experience went, the only host of the black cuckoo.

The new data, filling what was formerly a complete blank in the record concerning the growth and development of the young bird, may be summarized briefly as follows. On the first day after hatching the bird is naked, dark purplish in color, the gape pink, the back noticeably flat (not concave), and the eyes closed. On the fourth day the sheaths of the rectrices, remiges, and flank feathers begin to emerge; on the fifth day those of the feathers on the nape, throat, and forehead begin to appear; by the sixth day the bird has sheaths all over except on the back which is still nude. The eyes begin to open on the seventh day, and the bird begins to squeak softly. The feather sheaths begin to emerge on either side of the bare spinal area on the eighth day. By the ninth day the eyes are fully open; the back is still largely bare. The feathers start bursting from their sheaths on the 11th day, but the primary remiges are still encased in their sheaths. On the 16th day the bird is well feathered all over, and shows fear reactions by gaping with the head up and back, not forward as when expecting food; on the 21st day the bird was gone from the nest and was never seen again. The nestling period is therefore not more than 21 days. In the European cuckoo it is said to vary from 20 to 23 days.

In another nest of the boubou shrike Skead found a newly hatched black cuckoo and two eggs of the host. The next day one of the shrike's eggs hatched. The following day the young cuckoo was the sole occupant of the nest and no sign could be found of the shrike's egg or chick. The probability is that they were ejected by the cuckoo, but the ejection was not witnessed. The nest, being a rather shallow cup,

was such as would present no obstacle to ejection by the cuckoo. The inference is that the young parasite (definitely identified as a black cuckoo by its plumage when the feathers had grown out) tolerated, or at least did not eject, its nest-mates for the first 48 hours. It is, of course, unsafe to draw any hard and fast comparisons between a single instance in this species with what is known in its relatives, the red-chested cuckoo and the European cuckoo, but it may be pointed out that the eviction of its nest-mates was delayed in the case of the black cuckoo for at least 48 hours, as compared with less than 24 hours in a similar situation involving the red-chested cuckoo, and about the same in cases of the European cuckoo.

Cuculus poliocephalus Latham

Lesser cuckoo

Although this cuckoo does not remain in Africa during its breeding season as far as known, some courtship feeding behavior of interest has recently been recorded in Northern Rhodesia. Grimwood (in Smithers, 1952, p. 107) watched five of these cuckoos at Danger Hill, 25 miles from Mpika. Of these birds, two "pairs were indulging in what appeared to be courtship flights, chasing one another from perch to perch, and on alighting going through a feeding behaviour, though no food was seen to be transferred." While not surprising, it is of interest to find still another parasitic cuckoo exhibiting this atavistically revealing behavior pattern.

Chalcites cupreus (Shaw)

Emerald cuckoo

Additional data on this bird have to do with its host species and with its courtship behavior.

HOST RECORDS

In 1949 I quoted a peculiar account (Friedmann, 1949b, pp. 516-517) of the emerald cuckoo based on observations made on Principe Island that were attributed to Keulemans and published by Buller (1873, p. 76). Mr. F. Haverschmidt has since sent me a translation from the Dutch of Keulemans' (1866, pp. 363-401) observations on the birds of Principe Island. There is no mention of the queer story related by Buller, but merely Keulemans' statement to the effect that he was told by the inhabitants that this cuckoo deposits its eggs in the nests of *Cuphopterus Dohrni* (= *Horizorhinus dohrni*) and *Parinia leucophaea* (= *Speirops lucophaea*), which breed in the summer, and that it probably deposits them in the nests of other species as well.

A much later, and little known, paper by Keulemans (1907, pp. 245-247) gives further welcome details. He writes that the female emerald cuckoo lays her eggs in the nests of smaller birds that build open, cuplike nests, and mentions *Zosterops ficedulinus* and *Speirops leucophaea* as the usual foster parents. Of the latter species of host he relates a remarkable observation he made in July 1863 on his plantation on Principe Island. "Behind my small dwelling house grew a large Acacia tree, the branches of which nearly touched the balcony. A pair of *Parinias* (= *Speirops*) had built their nest so near the verandah that I could hear the young ones while they were being fed. One morning the pleasant sound of this young family calling for food had suddenly ceased. A week later I noticed a young Cuckoo lifting its head above the nest. Stranger still, two or three days later a second young cuckoo was to be seen in the same nest, and both these intruders were fed, not only by their original foster parents but also by at least a dozen other small birds." The nest and its contents came to grief a few days later.

These three hosts in Principe Island—*Horizorhinus dohrni*, *Zosterops ficedulinus*, and *Speirops leucophaea*—are all additional to our previous list. It is unfortunate that no details of actual instances are available for either of the first two. While there is nothing improbable in their being parasitized by the emerald cuckoo, Keulemans' unsupported statement does not constitute evidence in itself, and it cannot be claimed that birds of the first two species are known definitely as fosterers of the emerald cuckoo.

It may be pointed out that the *Speirops* case described above gives us the first evidence that more than one emerald cuckoo egg may be laid in one nest. We have no way of knowing if the two eggs were the product of a single bird or of two different individuals.

Winterbottom (1951, p. 27) lists the puff-backed shrike (*Dryoscopus cubla*) as a host of the emerald cuckoo but he gives no further data. Mackworth-Praed and Grant (1952, p. 509) also list puff-backed shrikes, together with bulbul, as the usual hosts of this cuckoo. However, I am aware of but a single specific instance of the puff-back in this capacity (J. Vincent, 1934, p. 761; a record overlooked before). The puff-back shrike is known better as a victim of the black cuckoo. However, its ecological habitat is much less strictly sylvan than that of the emerald cuckoo, being more like that of the black cuckoo.

On the other hand, hosts additional to those previously listed are indicated in the following observations. Guichard (1950, p. 168) found the Abyssinian bulbul (*Pycnonotus barbatus schoanus*) to be victimized at Addis Ababa, Ethiopia, while in Nyasaland Benson (1953, p. 35) records eggs of the emerald cuckoo in nests of *Chalomitra senegalensis gutturalis* and *Cyanomitra olivacea alfredi*. Benson also

lists (p. 113) a nest of the paradise flycatcher (*Terpsiphone viridis*) with two eggs of its own and one egg of the emerald cuckoo found at Blantyre, Nyasaland, on November 26. This flycatcher was previously known as a host from a single instance in the Belgian Congo. The subspecies in Nyasaland is *T. v. granti*, while the Congo bird is *T. v. viridis*. The crimson-crested black forest weaver (*Malimbis malimbicus crassirostris*) is added to the list of the known victims on the following basis. The van Somerens (1949, p. 95) record an egg (identified as an emerald cuckoo's by Pitman) from a nest of this forest weaver in the Bwamba area, Toro, western Uganda. An egg of the weaver, punctured and empty, lay on the ground below the nest.

One other bird not definitely known to be parasitized by the emerald cuckoo has been reported in a way suggestive of such a relationship. Holliday and Tait (1953, p. 116) watched a nesting pair of olive barbets (*Buccanodon olivaceum woodwardi*) at Ngoye Forest, Zululand. Once, when the barbets had gone foraging for food for their nestlings, an emerald cuckoo "approached the nest, made certain that the adult barbets were nowhere in the vicinity, and disappeared from view into the nest hole. All the time this was going on the young birds kept up their continuous clamour. Whilst the intruder was still within the nest, one of the parents arrived on the scene, and finding the unwanted visitor, attacked it fiercely and drove it away from the nest site. Owing to the fact that the nest was inaccessible, an examination of the nestlings was not possible, but one might assume that one of the chicks was probably a young cuckoo, and the parent was taking an active interest in its welfare, for it is not likely that it would be looking for a suitable nest in which to lay its eggs at this stage. As little is known about the breeding habits of Emerald Cuckoos, it is felt that this record is of some value, for some observers have seen it frequenting the nests of other species of barbets during the breeding season." The assumption that the adult cuckoo came to the nest because of a presumed interest in the welfare of an equally hypothetical nestling of its own kind has little enough to support it, but the fact that the cuckoo showed some interest in the nest suggests that such a site might be within the range of its potential choice of a receptacle for its eggs. Hitherto no hole-nesting bird as been found to be parasitized by the emerald cuckoo, or, for that matter, by any of the African metallic cuckoos of the genus *Chalcites*.

COURTSHIP BEHAVIOR

When I wrote my earlier account of this cuckoo nothing was known of its courtship behavior. Since then this gap has been partly filled by the interesting and valuable observations recorded by Haydock (1950, p. 150). He saw a female emerald cuckoo perched on a bare

branch of a defoliated tree. A male was on a higher branch, calling loudly; it flew down to the hen and, with wings drooping and tail erect, bobbed in front of her, and presented her with a large hairy caterpillar. This offering was accepted and devoured, the cock bird calling loudly with its head thrown well back during this time. A second similar display was then gone through, after which coition was attempted unsuccessfully. Shortly after this both birds flew away. Haydock's observations were made in central Northern Rhodesia in the third week in January.

In my earlier account of this cuckoo, mention was made of the fact that male birds seemed to be "territorial" and to establish singing posts to which they adhered day after day. These observations I made in western Kenya Colony. Welcome corroboration by virtue of similar observations now is available from the Upemba Park, Belgian Congo, where Verheyen (1953, pp. 319-320) found the same situation. He goes further and writes that the males reserve a well defined area which they defend against the intrusion of other males. This is, however, an unsupported statement as he does not describe any actual instances of territorial defense, and all I knew previously was merely the fact that males sang persistently from their singing posts.

In Principe and San Thomé Islands, Keulemans (1907) found this cuckoo to be migratory, being present on the islands only from February until November.

Chalcites klaas (Stephens)

Klaas's cuckoo

HOST SPECIES

All the new information on this cuckoo refers merely to additional host records, the total of which may now be raised from the 33 species listed in my earlier accounts to 42 species, or, if we count species and subspecies, to 50 forms. Of the total of all instances of this bird's parasitism known to me, 30 percent are with sunbirds as hosts, 23 percent with flycatchers, 16 percent with weavers, and the rest single or, at most, two records for wagtails, bulbuls, babblers, starlings, white-eyes, and finches. While 30 percent of the parasitized nests are those of sunbirds, the 10 species of this family recorded as hosts of the cuckoo amount to not quite 25 percent of the total known species of victims. Similarly, seven species of flycatchers, or about 16 percent of the total of 42 kinds of hosts, account for almost 25 percent of the recorded instances.

The arrow-marked babbler (*Turdoides jardinei*) is listed as a host of Klaas's cuckoo by Winterbottom (1951, p. 15), but no specific instances are given. I am not aware of any published pertinent data.

Another new host is the dusky flycatcher (*Alseonax adustus*), a pair of which were seen feeding a young Klaas's cuckoo on December 6 in Hottentot's Holland, Cape Province, by MacLeod and Murray (1952, p. 22). Still another species of *Alseonax*, the Uganda pygmy dusky flycatcher (*A. minimus pumilus*), may be added to the list, this one on the basis of three records. Williams (1946, p. 138) found a nest of this bird at Kampala, Uganda, on Apr. 27, 1946, that contained two fresh eggs of the builder and one very slightly incubated egg of the cuckoo. At Kitale, Kenya Colony, Stoneham (1952, p. 7) found two nestling Klaas's cuckoos, one in each of two nests of this flycatcher, near the garden of the museum early in 1952.

According to Benson (1953, p. 35), the gray tit-babbler (*Parisoma plumbeum orientale*) has been found to be parasitized in Nyasaland; he gives no further data on it, and lists it as an "apparent" host of Klaas's cuckoo.

In my book (Friedmann, 1949a, p. 140) I listed the Cape flycatcher (*Batis capensis*) as a host of this cuckoo solely on Joubert's statement that it was victimized in the Cape Province. Since then MacLeod and Murray (1952, p. 17) have recorded two instances in the Hottentot's Holland area, and Stauford (in litt.) sends me the following additional cases. On December 6 at Picnic Bush, Somerset West, Cape Province, he and J. G. MacLeod found a young Klaas's cuckoo, not quite ready to fly, completely filling a nest of a Cape flycatcher. Within 30 yards of this nest was another nest of the same species that had had a young Klaas's cuckoo in it a day or two earlier. In this area, in the years 1951–1952, Stanford and MacLeod found a total of five instances of the Cape flycatcher serving as host for Klaas's cuckoo.

To the previous meager data on the Cape paradise flycatcher (*Terpsiphone perspicillata*) may be added another instance, recorded at Hottentot's Holland by MacLeod and Murray (1952). The related *Terpsiphone viridis* is a bird of which two races, the nominate one and *suahelica*, have been previously listed as victims of Klaas's cuckoo. It seems that the race *speciosa* may serve in this capacity as well. Chapin (1953, p. 725) mentions a nest at Avakubi that contained one egg of the builder and one egg that probably was of this cuckoo.

The rufescent swamp warbler (*Calamocichla refescens*) is a bird not hitherto recorded as a victim of Klaas's cuckoo. Chapin writes me that near Tshibati, Belgian Congo, on Feb. 27, 1954, he found a nest of this bird high up on a fork of a stalk of elephant grass that contained a well-feathered nestling Klaas's cuckoo. The foster parents were scolding nearby as he examined the nest. The race of the host in the eastern Congo is probably *foxi*.

At the time of my first report (Friedmann, 1949a, p. 141) I knew of only two instances of the bar-throated warbler (*Apalis thoracicus thoracicus*) being parasitized. This number may now be increased as a result of observations by Skead (1952, p. 12), who found one such case in December 1946 and two more in January 1947.

The long-billed crombec (*Sylvietta rufescens transvaalensis*) was previously known as a victim of this cuckoo on the basis of a single case. To this may be added another quite unusual one. Mr. O. P. M. Prozesky informed me when I was in the Transvaal that on Dec. 27, 1950, at Buffelspoort, 50 miles northwest of Pretoria, he found a pair of crombees feeding two fledgling Klaas's cuckoos.

Another host previously known from one record and for which a second has now come to my attention is the gray-backed bush warbler (*Camaroptera brevicaudata abessinica*). Sir Charles F. Belcher writes me that he found a parasitized nest of this bird in Kenya Colony. The warbler had deserted it.

The tawny-flanked longtail, *Prinia mistacea* (subsp. *melanorhyncha*), was known to be victimized in the Gold Coast. Its eastern race, *immutabilis*, has since been found to be similarly affected in Kenya Colony, where Stoneham (1952, p. 7) found a nest at Kitale with three eggs of the longtail and one egg of Klaas's cuckoo.

Skead's (1954, p. 87) recent study of the greater double-collared sunbird has added six more instances of its usage as a victim by Klaas's cuckoo. It must be regarded as one of the chief hosts of the parasite in the Cape Province.

The East African mouse-colored sunbird (*Chalcomitra veroxii fischeri*) has been found to act as a host for Klaas's cuckoo in Kenya Colony by Belcher (in litt.). I had previously listed it as such in northern Zululand, but it now seems that the latter record refers to the nominate race of the sunbird.

Cinnyris venustus falkensteinii may be added to the known hosts of Klaas's cuckoo, as Mackworth-Praed and Grant (1955, p. 779) record it as being occasionally parasitized in East Africa. Previously I had known of only a single instance, involving the Abyssinian race *Cinnyris venustus fazoqlensis* (Friedmann, 1949a, p. 143).

The Kenya rufous sparrow (*Passer iagoensis rufocinctus*) is an addition to the recorded victims of Klaas's cuckoo. Belcher (1949b, p. 19) mentions, without further details, that he has in his collection eggs of Klaas's cuckoo taken from a nest of this sparrow. I understand from correspondence that there were two eggs attributed to the cuckoo in this nest and that the identification of the parasite is not really definite.

Chapin (1954, p. 339) records the masked weaver⁵ (*Ploceus intermedius intermedius*) as a host of Klaas's cuckoo on the strength of two

parasitized nests found in Uganda by Pitman. Each contained one egg of the weaver and one egg of the cuckoo.

The southern race of this weaver, *Ploceus intermedius cabanisi*, has also been found to be parasitized by Klaas's cuckoo in Southern Rhodesia, according to Mr. H. M. Miles. It had been recorded previously only as a host of the didric.

Layard's spot-backed weaver (*Ploceus nigriceps*) was described as a victim of Klaas's cuckoo on the basis of two such instances at Taveta, Kenya Colony (Friedmann, 1949a, p. 146). Farther south, at Mikindani in extreme southern Tanganyika Territory, it also appears to be a frequent victim. Grote (1924, p. 34) considers it a bird often imposed upon there by both this cuckoo and the related didric.

Masterson (1953, p. 51) recently added the red-headed weaver (*Anaplectes rubriceps*) to the known victims of this cuckoo. On Nov. 6, 1952, at Murambinda, Buhera District, Southern Rhodesia, he found a nest of this weaver that contained three eggs of its own and one egg that was presumed to be of a Klaas's cuckoo. The latter egg was freckled and was paler and slightly narrower than the host's eggs. A Klaas's cuckoo was calling excitedly in the vicinity and three times it tried to enter the nest in spite of the nearness of Masterson's natives who had climbed to the nest. Later, in January 1953, Masterson saw a pair of these weavers feeding a young Klaas's cuckoo in his garden.

The red bishop bird (*Euplectes orix*), a frequent host of the didric, also has been listed as an apparent host of Klaas's cuckoo in Nyasaland (Benson 1953, p. 35), but without further supporting details.

EGGS AND EGG LAYING

Recently MacLeod and Hallack (1956, pp. 2-5) described four eggs of this cuckoo—all laid in nests of the Cape flycatcher (*Batis capensis*)—as pinkish white and heavily spotted with reddish blotches forming a fairly definite ring around the blunt ends. No pinkish white eggs of this cuckoo were previously recorded. These authors think (but do not know) that all four eggs were laid by the same hen cuckoo. This is based on the similarity of the eggs, on the fact that all were found in nests within a limited area, and that all were found in nests of the same species of host. The evidence, if such it may be called, is merely suggestive, but, aside from adding another color type to the known eggs of Klaas's cuckoo, it is the first indication of the number of eggs laid and of host specificity in this species.

EVICTION OF NEST-MATES

In my earlier account I stated that while the young Klaas's cuckoo is usually the sole survivor in a nest, no information was available as to whether it evicts the other young or eggs in the nest or starves them

out in competition for the food brought to the nest by the hosts. While the present paper was awaiting publication, MacLeod and Hallack (1956) supplied our first definite observations on this point. They watched a parasitized nest of a Cape flycatcher. The Klaas's cuckoo hatched on November 9, and one of the host's eggs hatched on November 13. On November 14 the young cuckoo evicted the young flycatcher. At 9 a. m. on that day the cuckoo was noted underneath the young flycatcher, trying to heave it out of the nest; this attempt was unsuccessful, and was repeated at 9:25, again unsuccessfully. At 11:42 another attempt succeeded. The young *Batis* was left dangling by one foot, head down, from the outside of the nest. The adult *Batis* returned with food, took no notice of its rightful young, and fed the young parasite. A quarter of a hour later the young flycatcher fell to the rocks below.

Chalcites flavigularis (Shelley)

Yellow-throated cuckoo

This rare cuckoo remains still virtually unobserved. Its range may now be extended a short distance eastward to the Bwamba area, Toro, western Uganda, where the van Someren (1949, p. 29) collected a breeding female at Ntandi in July and where Ridley, Percy, and Percy (1953, p. 163) obtained another female in full breeding condition on September 27 near Hakitengya. The stomach contents of both birds consisted of hairy caterpillars, plus scale insects in the July bird and beetles in the September one.

Chalcites caprius (Boddaert)

Didric cuckoo

The new information on this cuckoo may be treated under several subdivisions.

HOST RECORDS

A considerable number of species of birds not listed in my earlier report have now been found to be parasitized by the didric cuckoo, bringing the total of its known hosts to 46 species, or 55 species and subspecies of birds. In addition, our knowledge of some that were included in the 1949 list has been considerably augmented. It becomes increasingly clear that the Ploceidae are the chief victims of the didric cuckoo; approximately three-fourths of all the nests recorded with eggs or young of the cuckoo belong to birds of this family.

The Cape wagtail (*Motacilla capensis capensis*) was included in my (1949a) book on the basis of one, not wholly satisfactory, record. However, an overlooked statement by Nicholson (1897, pp. 142-143)

reveals that in his garden at Pretoria a didric cuckoo layed an egg in a nest of the Cape wagtail and the egg was hatched and the young parasite reared by the host. Recently, Pike (in litt.) saw one of these wagtails feeding a fledgling didric on January 8 in the Transkei District, Cape Province. Skead (1952, p. 4) lists three more instances in the Cape Province. The Cape wagtail must be considered as a regular host of this cuckoo.

Winterbottom (1951, p. 15) writes that the didric is parasitic on the arrow-marked babbler (*Turdoides jardinei*). I know of no definite instance, although it may be recalled that Swynnerton (1911, p. 19) once shot a didric as it was leaving a nest of this babbler. There was no cuckoo's egg in the nest, however.

The small-billed brown flycatcher (*Bradornis microrhynchus*) is a new host of the didric. Belcher (in litt.) informs me that he collected an egg of this cuckoo from a nest of this bird near Ngong, Kenya Colony. He felt satisfied as to the identity of the species of cuckoo involved.

The Shoa olive sunbird (*Cyanomitra olivacea ragazzii*) is a possible addition to our previous list of hosts. Reichenow (1881, p. 16) mentions a didric's egg found by G. A. Fischer in a nest of this sunbird. This egg is said to have been given to the Nehrkorn Collection, but the catalog of that collection makes no mention of it. It is not stated how the identification of the egg was decided; it may have been a Klaas's cuckoo.

Skead (1952, p. 5) has tentatively listed the yellow-throated sparrow (*Petronia superciliaris*) as a victim of the didric cuckoo, but he states that the parasitic egg seen in the one nest involved may have been that of a greater honey-guide. I think the latter is probably correct; the record should be deleted from the list of didric hosts.

Vieillot's black weaver (*Ploceus nigerrimus*) was known previously to be parasitized in Uganda and in the Belgian Congo. To this may be added that Serle (1954, p. 55) found a fledgling didric cuckoo, unable as yet to fly, beneath a nesting colony of these black weavers on January 24 at Kumba, British Cameroons.

The black-headed weaver (*Ploceus melanocephalus*) is a species new to our list of victims, but it was actually recorded in this capacity as long ago as 1899 by Louis Petit (1899, pp. 66–67) in the French Congo. The race of the weaver in that area is *P. m. capitalis* (Latham). Petit writes that the didric is parasitic on this weaver, and that the latter rears the young parasites.

Two other races of the black-headed weaver may also be mentioned in the present connection. Indefinite observations by Verheyen (1953, p. 315) suggest that Dubois' black-headed weaver (*Ploceus*

melanocephalus duboisi) may be parasitized by the didric in the Belgian Congo.

The Uganda yellow-collared weaver (*Ploceus melanocephalus dimidiatus*) has been recorded, without supporting data, as a victim of the didric cuckoo. Distant (1897, p. 143) states that Jackson found an egg "considered to be of this cuckoo" in a nest of this weaver.

To the meager data previously available on Layard's spot-backed weaver (*Ploceus nigriceps*) as a didric victim in southern Tanganyika Territory may be added that Benson (1953, p. 35) found it to be parasitized in Nyasaland as well.

In my earlier account (1949a, p. 173) it was noted that Cabanis' masked weaver (*Ploceus intermedius cabanisi*) had been reported as a fosterer of the didric in South Africa by Roberts. Recently Lamm (1955, p. 34) wrote that this weaver appears to be the principal host of this cuckoo in southern Mozambique. He also suggested that the spotted-backed weaver (*Ploceus spilonotis spilonotus*) is probably a frequent victim of the didric in that region. Previous data on this bird as a host were all from the Union of South Africa.

I have recorded (Friedmann, 1949a, p. 175) the spectacled weaver (*Ploceus ocularius ocularius*) as not too certainly established as a known host of the didric cuckoo. A definite instance has since been recorded by Skead (1952, p. 9) at King William's Town, Cape Province.

Previously (Friedmann, 1949a, p. 176), I included Smith's golden weaver (*Ploceus subaureus subaureus*) as a victim of the didric only on the strength of its being so listed by Patterson and by Sparrow, since no specific instances were known to me at the time. Since then, D. C. H. Plowes has informed me that at Umkomaas, Natal, on Jan. 2, 1949, he collected a nest of this weaver containing two eggs of the host and one of the didric cuckoo.

New to our earlier list of victims is the Zambesi brown-throated weaver (*Ploceus xanthopterus*). A young didric cuckoo was found in a nest of this bird at Karonga, Nyasaland, on February 25 (Benson and Benson, 1949, p. 165).

Also new to the roster of the didric's hosts is the red-winged anaplectes (*Anaplectes rubiginosus*) listed in this capacity in Nyasaland by Benson (1953, p. 35).

The red bishop bird (*Euplectes orix*) was recorded earlier as a frequent victim, but how frequently it suffers from the attention of the parasite has recently been made clear by Reed (1953, pp. 138-140), who found no fewer than 23 parasitized nests in the Transvaal.

The Zanzibar red bishop bird (*Euplectes nigriventris*) may be a host that previously was overlooked. Fischer (1880, p. 190) found a nest of this weaver with a live female didric caught entangled on it. The

nest contained three eggs, of which one was smashed and the others seemed to be *Euplectes* eggs. It must be cautioned that there is no proof of parasitism in this case; the cuckoo may have come to lay there or to eat one of the eggs in the nest.

The fire-crowned bishop bird (*Euplectes hordeaceus sylvatica*) does not appear to have been recorded as a victim of the didric cuckoo until Benson (1953, p. 35) listed it as a host of this parasite in Nyasaland, but without further details. In the Upemba Park, Belgian Congo, Verheyen (1953, p. 315) saw a hen didric entering a colony of the nominate race of this bishop bird but he did not obtain evidence of any actual parasitism.

The white-winged whydah (*Colius passer albonotatus albonotatus*) is suspected of being a host of the didric in Southern Rhodesia by Edwards, according to Miles (1951, p. 4), but no definite evidence seems to be known.

The golden-breasted bunting (*Emberiza flaviventris*) has been definitely added to the known victims of this cuckoo by Haydock (1950, p. 150; 1951, p. 3) in Northern Rhodesia. He observed nestling didries, one in each of three nests of this bunting, as well as three young didries already out of the nest apparently attended by the buntings.

When discussing the Cape rock bunting (*Fringillaria capensis*) as a host of the didric, I mentioned (Friedmann, 1949a, p. 177) that although several writers had listed it as such, no localities or other particulars were available. It seems that these authors were copying from one another, and that the original source of them all was Mrs. Barber, who apparently made her observations in the Transvaal. Sharpe's edition of Layard's "Birds of South Africa" (1875, p. 155) appears to contain the first mention of Mrs. Barber's data.

EGG LAYING

In my earlier report I stated that there is good evidence to the effect that the didric hen often, if not regularly, may remove an egg from the nest when laying its own into it. Skead (1952, p. 9) came to a similar conclusion as well, but Reed (1953, pp. 138–140) concluded that the opposite seemed to be the case. Reed studied the didric's parasitism on the red bishop bird, and found that the cuckoo "does not appear to remove an egg of the . . . host . . . the normal Red Bishop clutch is three eggs and nearly all nests containing cuckoo eggs carried a total of four eggs." While he gives data on some 23 instances in which the red bishop bird was parasitized by the didric, most of these cases were of nests with young cuckoos; in only six nests does he record four eggs each (three bishop bird eggs and one didric egg).

Inasmuch as this matter of removing an egg often involves the eating of it by the didric, it may be noted that Calder (1951, p. 36) watched a hen didric enter a nest of a thick-billed weaver (*Amblyospiza albifrons*), emerge with an egg in its bill, and then eat the contents. No cuckoo's egg was in the nest when it was examined a few minutes later, but it would seem that this weaver may have been intended as a fosterer. It would not be surprising if someone were to find it to act in this capacity.

In the disputed matter of adaptive similarity between the eggs of the cuckoo and those of its victims, the recently amassed data are just as conflicting as was the older information. Reed noted a definite similarity between didric eggs in nests of the red bishop bird and those of the host, while Skead found noticeable contrast between didric eggs and those of the builders in nests of Cape wagtails and Cape weavers.

EVICTING HABIT

The evicting habit in this cuckoo still presents unsolved problems, but the following data, subsequent to my earlier account (Friedmann, 1949a, pp. 179-181), are of interest. No one has yet seen a didric chick in the act of ousting either eggs or young from the nest. The evidence from which eviction is assumed to have taken place is merely the fact that eventually the parasite is usually the sole occupant of the nest. Assuming that the young cuckoo is responsible for the disappearance of the other nest contents, Skead (1952, pp. 7, 9) found that a nestling didric in a Cape wagtail's nest "tolerated" the two eggs of the host for two days after it hatched, when one egg was found below the nest and the other was out of the nest early the next morning (i. e., after 2½ days). In a Cape weaver's nest there were two weaver's eggs when the didric hatched; the next day one of the weaver's eggs hatched, but the following day both it and the unhatched egg were gone, leaving the didric as sole occupant. In a spectacled weaver's nest there was one egg of the host when a didric hatched; both remained in the nest for two days, after which the cuckoo was the only occupant. From these three examples it appears that 2 or 2½ days may be the usual time for the "eviction" (or disappearance from the nest) of the cuckoo's nest-mates. However, this is by no means universal, as Reed (cit. supra) found in the case of a parasitized nest of the red bishop bird. When the didric hatched there were two of the host's eggs and one of its chicks in the nest, while four days later the nest contained three chicks of the bishop bird and the young cuckoo. Unfortunately, Reed's observations ended at that point. However, in another nest of the same host species he found a didric about four days old as the sole occupant. At 1:30 p. m. he placed two eggs of the bishop bird in the nest; by 6 p. m. (4½ hours later)

both of these were out of the nest, the inference being that they were ejected by the cuckoo. Reed's general observations, based not only on these two cases but on many other less detailed instances, are that the didric nestling "appears to eject the eggs or young of its host in all cases because in no single instance were large Didric Cuckoo chicks found with Red Bishop young in the same nest."

Contrary to all the above are the cases observed by Pitman and by Chapin (Friedmann, 1949a, pp. 180–181) in which the cuckoo and its nest-mate grew up together until leaving the nest. The type of experiment tried by Reed should be repeated, with constant observation to see if, and how, ejection is performed.

FLEDGLING FEEDING

Another observation of fledgling feeding by a didric cuckoo comes to me from Pike, who saw, in the Transkei area, Cape Province, on December 11, a well grown young didric being fed by an adult male of the same species. This further supports the general conclusion that fledgling feeding is done by the male, and, to this extent, bolsters the thought that fledgling feeding may be only courtship feeding with a grown young being mistaken for a hen by the cock bird.

Additional cases of a male didric feeding another of its kind have been published by Maclaren (1953, p. 167; 1952, pp. 684–685), but the light was poor on all occasions and he was unable to determine if the birds being fed were adult females or fully fledged young.

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