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## A SYSTEMATIC REVISION AND NATURAL HISTORY OF THE SHINING SUNBIRD OF AFRICA

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The Shining Sunbird (*Cinnyris habessinicus* Hemprich and Ehrenberg) has a comparatively restricted distribution in the northeastern part of the Ethiopian region. It occurs sporadically from the northern districts of Kenya Colony and northeastern Uganda northward to Saudi Arabia, but it apparently is absent from the highlands of Ethiopia (Abyssinia) above 5000 feet. The adult male is one of the most brightly colored African sunbirds, the upper parts and throat being brilliant metallic green, often with a golden sheen on the mantle, and the crown violet or blue. Across the breast is a bright red band, varying in width, depth of color, and brilliance in the various races, bordered on each side by yellow pectoral tufts; the abdomen is black. The female is drab gray or brown and exhibits a well-marked color cline, the most southerly birds being pale and those to the northward becoming gradually darker and terminating with the blackish-brown female of the most northerly subspecies.

In the present study I am retaining, with some reluctance, the genus *Cinnyris* for the species under review. I agree in the main with Delacour's treatment of the group in his paper (1944) "A Review of the Family Nectariniidae (Sunbirds)" and admit that the genus *Nectarinia*, in its old, restricted sense, based upon the length of the central pair of rectrices in the adult male, is derived from a number of different stocks and is unsound. Nevertheless, I consider that the merging of these two genera and others does not give a clearer picture of the relationships of the various species, while it does create a genus of unwieldy proportions. I feel that it may be the wiser course to retain genera such as *Cinnyris* and *Chalcomitra* until such time as a complete generic revision can be undertaken, based on extensive spirit and skeletal material in addition to study skins. I may mention that with this end in view I am building up a spirit collection of the African members of the Nectariniidae, which eventually will be available for anatomical study.

Sclater (1930) recognized two races of *Cinnyris habessinicus*, the nominate form and *C. h. hellmayri* Neumann of southwestern Arabia. He regarded *C. h. alter* Neumann and *C. h. turkanae* van Someren as synonyms of *habessinicus*. Another race, *C. h. kinneari* Bates, was described five years after the publication of Sclater's work. It is difficult to understand Sclater's treatment of the species. Even though he lacked extensive series of this sunbird from throughout its range, it is remarkable that he should not have recognized *turkanae*, which is strikingly different from any other race in having a very broad red breast band, and *alter*, which is noticeably large.

During the past few years I have undertaken four expeditions, to the southeastern Sudan, Turkana, Northern Frontier District of Kenya Colony, Italian Somalia, and British Somaliland, with the object of collecting an adequate study series of the southern and Somaliland races of this sunbird and observing its habits in the field. The present study of the status and geographic distribution of the races of *C. habessinicus* is based on 156 specimens, representing all races in all plumages.

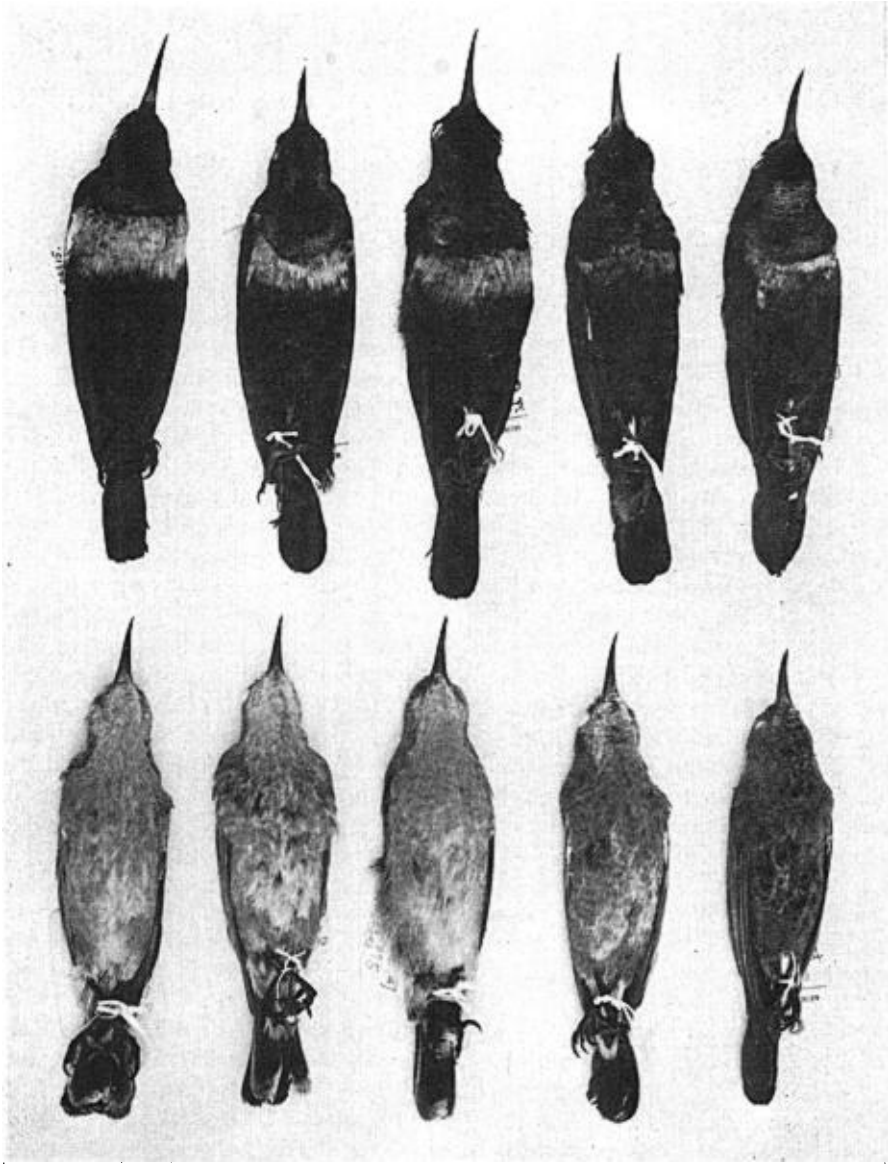


Fig. 1. The races of *Cinnyris habessinicus*. From left to right (males above, females below): *turkanae*, *habessinicus*, *alter*, *hellmayri*, and *kinneari*. Photograph by J. S. Karmali.

#### THE RACES OF CINNYRIS HABESSINICUS

*Cinnyris habessinicus* is readily divisible into five well-marked races, three on the African mainland and two in Arabia, distinguishable by plumage and structural characters in the adults (fig. 1). Immature birds have not been specially mentioned in the descriptions of individual subspecies, but variation in their plumage characters follows that of the adult female, being paler in the southern races and darker in the more north-

ern. All measurements quoted are in millimeters, taken to the nearest half millimeter. Wing measurements were taken from the flattened wing.

### *Cinnyris habessinicus habessinicus* (Hemprich and Ehrenberg)

*Nectarinia (Cinnyris) habessinicus* Hemprich and Ehrenberg, Symb. Phys., 1828:fol.a, pl. iv; Eilet, Eritrea.

*Characters*.—The smallest race (table 1); adult male characterized by relatively narrow, deep red breast band, 7.5–11 wide (20 measured), fringed below with a line of metallic bluish feathers. Adult female intermediate in color between paler race *turkanae* and two darker Arabian races, *hellmayri* and *kinneari*; and lacks ill-defined greenish-orange breast band frequently found in adult female *alter*.

*Distribution*.—Eritrea and adjoining districts of Ethiopia (Abyssinia) and the northeastern Sudan north to the Egyptian border. Intergrades with *alter* in the Harar region of Ethiopia and probably in French Somaliland.

*Localities from which specimens examined*.—ERITREA. Maritime plains near Massawa; Eilet Plain (eastern Eritrea); near Adi Ugei (in Eritrean highlands). SUDAN. Port Sudan; Gebel Elba on the Egyptian border. ETHIOPIA. Dire Daua, Harar district; these specimens are intergrades between *habessinicus* and *alter*.

Meinertzhagen (1930:171) recorded two specimens of *C. habessinicus* collected at Gebel Elba, on the northeastern border of the Sudan, that were identified as the race *hellmayri*, known otherwise only from southwestern Arabia. These two specimens have not been available for the present study, but another specimen, an adult male, from Gebel Elba agrees perfectly in both plumage and size with a series of the nominate race from Eritrea. Measurements of this specimen are wing 65, exposed culmen 19, tail 45, tarsus 15.5. In addition, Mr. J. D. Macdonald informs me that two specimens of *habessinicus* from Gebel Elba in the British Museum (Natural History) collections also are referable to the nominate race. On this evidence it is obvious that the two specimens from Gebel Elba referred to by Meinertzhagen were wrongly identified and that the race occurring there is *habessinicus*.

### *Cinnyris habessinicus turkanae* van Someren

*Cinnyris habessinicus turkanae* van Someren, Bull. Brit. Ornith. Club, 60, 1920:94; Kohua River, Lake Rudolph, Turkana, Kenya Colony.

*Characters*.—Averages slightly larger than *habessinicus* in length of wing, tail, and tarsus, and has a longer bill. Adult male differs from all other races in having very broad and paler red breast band, 14–19 wide (23 measured), with only slightest indication of metallic feathering below, or, more generally, no fringe of metallic feathers at all. Female paler below than in any other race.

*Distribution*.—The Northern Province and Turkana districts of Kenya Colony, northeastern Uganda, southeastern Sudan, southern Ethiopia (Abyssinia), and the southern half of Italian Somalia north to latitude 6°N.

*Localities from which specimens examined*.—KENYA COLONY. Northern Frontier District: Malka Murri on the Daua River; Mandera. Turkana: Lodwar district; Lokitaung; Turkwell River; Kohua River; Ferguson's Gulf, Lake Rudolph. UGANDA. Karamoja-Turkana border, west of Lodwar. SUDAN. The Ilemi Triangle (southeastern Sudan). ETHIOPIA. Scenan, Arussi plateau (southern Ethiopia). ITALIAN SOMALIA. Dolo, Juba River; Belet Uen and 30 miles north of Belet Uen.

In his original description, van Someren (1920:94) mentioned, in addition to the character of the wider and paler red breast band, that *turkanae* differs from *habessinicus* in being more golden-green above with the rump also golden-green, not bluish. While most specimens of *turkanae* fit this description, there also are Eritrean specimens of *habessinicus* which are equally golden-tinged above, so that this character cannot be used in separating the two races.

Table 1

Measurements of Adult *Cinnyris habessinicus* in Millimeters

Race	Dimension	Sex	Number of specimens	Range	Mean	Standard deviation
<i>C. h. habessinicus</i>	Wing	♂ ♂	20	64-68	66.22	1.03
		♀ ♀	8	58.5-60	59.00	0.45
	Exposed culmen	♂ ♂	20	18.5-20.5	19.50	0.67
		♀ ♀	8	18-19	18.37	0.44
	Tail	♂ ♂	20	44-48	46.40	1.18
		♀ ♀	8	40-41	40.62	0.51
Tarsus	♂ ♂	20	15.5-16	15.85	0.74	
	♀ ♀	8	15.5	15.50	.....	
<i>C. h. turkanae</i>	Wing	♂ ♂	23	66-69	67.10	0.92
		♀ ♀	11	58-60	58.81	0.87
	Exposed culmen	♂ ♂	23	21-23	21.93	0.52
		♀ ♀	11	19.5-21.5	20.45	0.61
	Tail	♂ ♂	23	46-51	48.34	1.55
		♀ ♀	11	39-41	40.91	0.53
Tarsus	♂ ♂	23	16-17	16.52	0.43	
	♀ ♀	11	16-16.5	16.13	0.23	
<i>C. h. alter</i>	Wing	♂ ♂	28	69-72	70.37	1.01
		♀ ♀	12	61-64	62.58	0.90
	Exposed culmen	♂ ♂	28	22.5-25	23.46	0.80
		♀ ♀	12	20-22	21.00	0.67
	Tail	♂ ♂	28	48-56	51.89	2.01
		♀ ♀	12	43-49	45.33	2.34
Tarsus	♂ ♂	28	17-18	17.71	0.24	
	♀ ♀	12	17-17.5	17.20	0.26	
<i>C. h. hellmayri</i>	Wing	♂ ♂	7	70-75	72.00	1.82
		♀ ♀	5	62-66	64.40	1.26
	Exposed culmen	♂ ♂	7	21.5-23	22.35	0.62
		♀ ♀	5	20-21.5	20.90	0.54
	Tail	♂ ♂	7	51-56	54.42	1.76
		♀ ♀	5	44-49	46.40	2.51
Tarsus	♂ ♂	7	16.5-17	16.85	0.24	
	♀ ♀	5	16	16.00	.....	
<i>C. h. kinneari</i>	Wing	♂ ♂	5	70-75	72.00	0.59
		♀ ♀	2	64-65	.....	.....
	Exposed culmen	♂ ♂	5	18.5-20	19.20	0.57
		♀ ♀	2	17.5-19	.....	.....
	Tail	♂ ♂	5	51-57	54.60	2.30
		♀ ♀	2	49-50	.....	.....
Tarsus	♂ ♂	5	16-16.5	16.40	0.22	
	♀ ♀	2	15.5-16	.....	.....	

*Cinnyris habessinicus alter* Neumann

*Cinnyris habessinicus alter* Neumann, Ornith. Monatsb., 14, 1906:7; North Somaliland to Harar.

*Type locality*.—In his original description, Neumann did not designate an exact type locality. Since specimens from the Harar district are somewhat intermediate between *alter* and the nominate race, it is desirable that an exact type locality be designated. As Neumann mentions North Somaliland within the range of this race, I propose to fix the type locality of *Cinnyris habessinicus alter* Neumann to Erigavo (latitude 10° 40' N, longitude 47° 25' E), 6500 feet, northeastern British Somaliland.

*Characters.*—Resembles *habessinicus* but larger, with a much longer bill. In adult male red breast band deep in color, 9–13 wide (28 measured), with well-marked fringe of metallic bluish or violet-green feathers. Adult female darker above and below than either *habessinicus* or *turkanae*; many specimens tend to have an ill-defined band of greenish-orange across the breast.

*Distribution.*—British Somaliland and adjoining areas of Ethiopia, and northern Italian Somalia. Intergrades with *habessinicus* in the Harar region of northern Ethiopia, and probably in French Somaliland.

*Localities from which specimens examined.*—BRITISH SOMALILAND. Sheikh; Hudin; Erigavo; Hargeisa; Berbera; Garadak; El Afwein; the escarpment north of Erigavo; Medishe. ETHIOPIA. Hargeisa-Harar road. NORTHERN ITALIAN SOMALIA. Gardo.

Specimens collected near Berbera and farther east on the maritime plain are typical *alter*, showing no approach to the nominate race. A most interesting aberrant adult male of *alter* was collected near Hudin, southeastern British Somaliland, on March 6, 1954. In this specimen the bluish-green feathering below the red breast band extends to cover the lower breast, flanks, and under tail-coverts, and even the black abdomen is slightly glossed with green. There can be no doubt that this is merely an individual variant. Several other specimens collected in the same locality are typical examples of *alter*.

### *Cinnyris habessinicus hellmayri* Neumann

*Cinnyris habessinicus hellmayri* Neumann, Ornith. Monatsb., 12, 1904:29; mountains north of Lehej.

*Characters.*—Similar in size to *alter* but bill shorter. Adult male differs conspicuously from the three African mainland races in having red breast band obscured and greatly darkened throughout by subterminal bars of metallic greenish-blue; also, metallic crown more bluish, less violet, than in other races. Adult female resembles female *alter* but plumage darker, although not blackish-brown as in female *kinneari*.

*Distribution.*—Southwestern Arabia from Yemen and the Aden Protectorates, including the Hadhramaut, north to the Saudi Arabian border.

*Localities from which specimens examined.*—ADEN PROTECTORATE. Lodar. YEMEN. Taiz.

The pectoral tufts of adult male *hellmayri* are reputed to be paler than in other races, but I do not find that this is constantly the case. While two specimens have paler yellow tufts than is usual, other examples from the same locality have pectoral tufts as bright as in any specimen of the other races.

### *Cinnyris habessinicus kinneari* Bates

*Cinnyris habessinicus kinneari* Bates, Bull. Brit. Ornith. Club. 55, 1935:120–121; near Sail (east of Mecca).

*Characters.*—Size as in *hellmayri* but bill constantly shorter. Adult male differs from *hellmayri* in having only lower two-thirds of breast band obscured and darkened by bluish subterminal bars, thereby isolating a narrow red collar immediately below the metallic green throat.

Adult female very distinct from females of any other race, being much darker in color, almost blackish in some examples, and feathers of the throat and abdomen have narrow pale fringes producing scaly appearance. These pale fringes are present in the females of the other races but are not conspicuous as they do not contrast with the basic plumage color (see color plate).

*Distribution.*—Western Saudi Arabia, north to the Hejaz, south to the Tihama, and into the foothills of Asir.

*Localities from which specimens examined.*—SAUDI ARABIA. Sail Kebir; Madriga near Jidda; Hadda near Jidda; Birka, Hejaz.

It is remarkable that only Meinertzhagen (1954:592) has called attention to the difference in plumage between adult males of *kinneari* and *hellmayri*. Apart from the difference in the red breast band, males of the two races may be distinguished on bill length. It has been suggested incorrectly that the blackish-brown females of *kinneari* are juvenal males which have been wrongly sexed and that the females of this race are

not distinguishable from females of *hellmayri*. It is undeniable that the juvenal plumage of this race is very dark indeed—almost completely black below—but no one having experience with sunbirds could mistake an adult female for a juvenile. To confirm that the two female specimens in my possession were adults, I relaxed the skins and found, as I had expected, that both skulls were completely ossified.

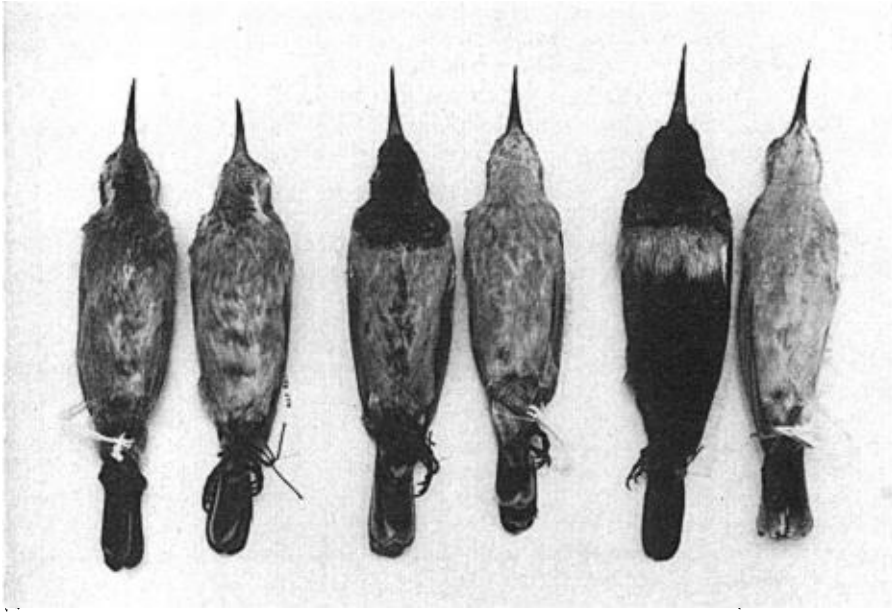


Fig. 2. The plumages of *Cinnyris habessinicus*. From left to right: juvenal male, juvenal female; immature male, immature female; adult male, adult female. Specimens are *C. h. turkanae*. Photograph by J. S. Karmali.

#### PLUMAGES

All races of *Cinnyris habessinicus* possess three distinct plumages, juvenal, immature (intermediate) and adult (fig. 2).

The juvenal plumage of both sexes resembles that of the adult female but the body feathers are juvenal in texture. In color and markings it differs from that of the adult female in having the chin whitish, the white merging on the throat into a black patch which extends on to the breast and which is bordered on each side by a line of whitish feathers. The juvenal male usually has a blacker throat than the juvenal female, in which the black throat patch is often obscured by whitish tips to some of the feathers. *Cinnyris habessinicus* in juvenal dress may be mistaken for juveniles of the closely allied *Cinnyris mariquensis*, especially as the two species are often found in the same haunts. Juvenal *C. mariquensis* differs from *C. habessinicus* in having the black throat patch continue on to the breast and flanks as a series of large, blackish, droplike spots; it is also usually strongly washed with yellow on the underparts.

Mackworth-Praed and Grant (1945) state that the immature plumage is acquired by a complete molt which includes wings and tail. I do not find that this is the case in most instances. In a series of 22 specimens examined I found that molt into immature plumage involved the body feathers only, with occasionally an odd pair of rectrices and

some wing feathers being renewed. However, in one immature specimen, a male of *alter* from Medishe, Erigavo district, British Somaliland, the molt had been complete, including wings and tail. In this specimen the newly molted wing feathers are as in the adult female, but the rectrices are darker, although not so black as in the adult male. The immature male plumage closely resembles that of the adult female above, but below it has the chin, throat, and upper breast metallic green, bordered below by a few red feathers. The belly is as in the adult female, but usually there are a few black feathers present. The immature female closely resembles the adult plumage, and some immatures (age confirmed by examination of skull ossification) cannot be distinguished from adult females, but as a rule immatures have darker centers to the breast feathers, giving a mottled effect.

The adult plumage of both sexes is acquired by a complete molt, involving wings and tail. When this molt is completed the first-adult dress is not distinguishable from the plumage of older birds. *C. habessinicus* has no eclipse plumage, the adult male molting from metallic dress to metallic dress. The following adult males in molt have been examined:

*C. h. habessinicus*. Eritrea: Adi Ugui, October. Sudan: Port Sudan, December (molt almost complete).

*C. h. turkanae*. Kenya Colony: Turkana, September.

*C. h. alter*. British Somaliland: Berbera, December (molt almost complete).

*C. h. hellmayri*. Yemen: Taiz, December. Aden Protectorate: Lodar, December.

*C. h. kinneari*. Saudi Arabia: Madriga near Jidda, January (molt almost complete).

#### NATURAL HISTORY

*Habitat*.—Rocky or sandy broken country with a coverage of acacia trees is the main habitat of *Cinnyris habessinicus*. It especially favors dry river beds (wadis) with flowering *Acacia* and *Ziziphus* trees and bushes, and it is also much attracted to the flowers and fruits of the bushy *Salvadora persica*.

In Eritrea the nominate race is common in acacia bush country from sea level up to an altitude of 4000 feet on both the eastern and western sides of the Eritrean plateau (Mr. K. D. Smith, *in litt.*). Above that altitude it is absent from the plateau itself but occurs sparingly up to 6000 feet in wooded or scrub-covered mountain valleys in the northern, western, and southern parts of the country.

The race *alter* has a greater altitudinal range than *habessinicus*. It is equally at home among the thorn trees in the sweltering heat of the maritime plain and in the high-level juniper forest region of northeastern British Somaliland, where in the early mornings the ground and vegetation are white with hoar frost. In the Erigavo juniper forest at 7000 feet *alter* was especially abundant, feeding in numbers among the blossoms of a bushy, purple-flowered *Salvia*. For two or three hours after dawn only those *salvia* bushes in direct sunlight were visited, those in the shade being completely neglected. It seemed strange to see this sunbird, which one usually associates with arid, rocky, thorn-bush country, so completely at home in forested surroundings, especially when dense moisture-laden clouds enveloped the landscape and visibility was reduced to a few yards. The birds spent most of their time seeking insects and spiders among the branches of the juniper trees and the hanging clumps of *Usnea* with which the branches were festooned. Their appearance at such times was strongly reminiscent of *Cinnyris mediocris* in the mountain forests of Kenya and Tanganyika. At lower altitudes in its range *alter* does not differ in its habits from the other races, but perhaps it shows a greater preference for the flowers of *Calotropis procera*.

The race *turkanae*, unlike the other two African races, does not appear to occur in localities above 4000 feet and is most frequent in areas below 2000 feet. In the Northern

Frontier and Turkana districts of Kenya Colony it was encountered most commonly in rocky, semi-desert country with mixed *Acacia*, *Ipomoea*, and *Commiphora* scrub (fig. 3). In Turkana it also occurs in *Acacia* trees and thickets of *Salvadora persica* scrub bordering dry, sandy riverbeds. Near Lodwar, Turkana, I found great concentrations of sunbirds attracted to fruiting *Salvadora* bushes, and the bushes seemed alive with these active, brilliantly colored birds. Also, the long-tailed, golden-breasted sunbird *Hedydipna platura* was abundant, together with dozens of *Nectarinia pulchella* and



Fig. 3. Typical habitat of *Cinnyris habessinicus turkanae* in northern Kenya Colony, showing rocky, semi-desert country with mixed *Acacia*, *Ipomoea* and *Commiphora* scrub. Photograph by Desert Locust Control and Survey Organization.

*Cinnyris venustus*, the odd *Cinnyris mariquensis*, and a host of *Cinnyris habessinicus turkanae*. It was certainly an experience of note to stand in the center of a clump of *Salvadora* bushes while twenty or thirty sunbirds fed all around, quite unconcerned by the intrusion of a human into their domain.

In Arabia both *hellmayri* and *kinneari* inhabit rocky and sandy country mainly below 4000 feet, favoring wadis with a light growth of thorny *Acacia* and *Ziziphus* trees and bushes such as *Salvadora* and *Calotropis* (fig. 4). *C. h. kinneari* is reputed to have greater preference than *hellmayri* for the few cultivated areas which exist in its range.

*Food.*—The fruits of the bush *Salvadora persica*, which resemble tiny bunches of grapes, form an important item in the diet of all races of *Cinnyris habessinicus*, and it has been my experience that when feeding on these fruits the birds take comparatively little animal food. At other times, spiders, various small insects and insect larvae, and nectar complete the diet. Two specimens of the nominate race collected at Port Sudan had their stomachs crammed with small spiders and some insect fragments, including Diptera and Coleoptera. An examination of the stomach contents of *turkanae* showed that spiders also form the bulk of the animal food taken, spider fragments being present



in nearly every specimen examined. Also present, in their order of abundance, were remains of the following insects: Diptera; minute Coleoptera; Lepidoptera larvae; minute Hemiptera, and, once, Hymenoptera (possibly small chalcids). *C. h. turkanae* obtains its spider and insect food among blossoms and, sometimes, the foliage of various trees and shrubs. It also visits the fruits of fig trees when these are ripe. Flowers especially favored are those of various species of *Acacia*, the spiny *Ziziphus spina-christi*, *Salvadora*, and a red- and yellow-flowering *Loranthus* parasitic on acacia trees. Spiders

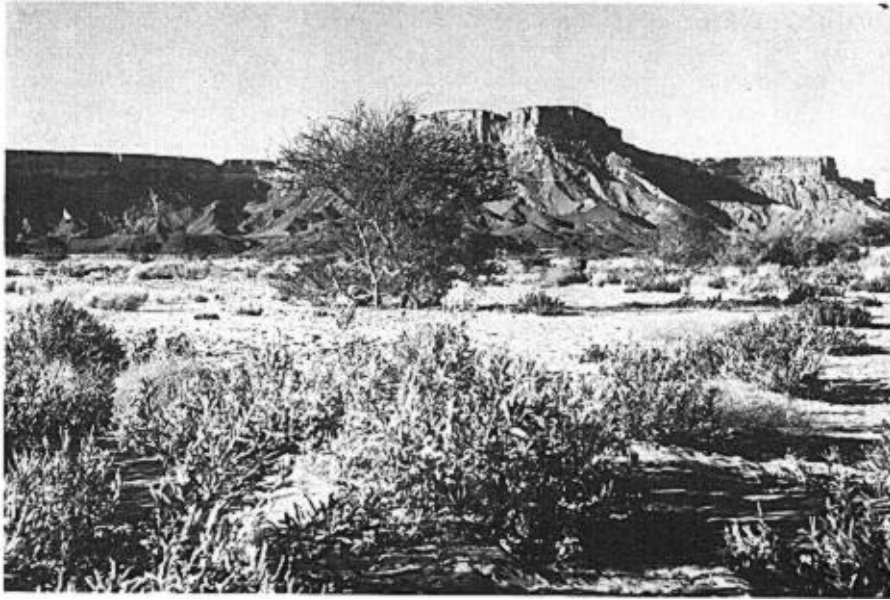


Fig. 4. Wadi near Bir Asakir, Hadhramaut, the haunt of *Cinnyris habessinicus hellmayri*. Photograph by Desert Locust Control and Survey Organization.

also form the main item of diet in the race *alter*, but specimens collected in the juniper forest north of Erigavo had taken more Diptera and minute Coleoptera than had birds collected at lower altitudes. One bird from this locality had its throat, crop, and stomach crammed with a small species of termite in the flying stage. The feeding habits of *hellmayri* and *kinneari* do not appear to differ from those of other races. The former is said to be much attracted to the inflorescence of date palms.

*Field appearance.*—In the field *Cinnyris habessinicus* appears as a medium-sized golden-green sunbird with a black belly and a red breast band, which is more or less conspicuous according to the race observed. The female is readily identifiable by its uniformly colored pale or dark gray underparts.

When one is used to the appearance of *turkanae* and *alter* in the field, the impression on first seeing the race *habessinicus* alive is its small size. It is possible to confuse the male of the nominate race with the male of *Cinnyris mariquensis osiris* unless a good view of the former's red breast band is obtained, especially as the yellow pectoral tufts, which also distinguish *habessinicus* from *mariquensis*, are not usually conspicuous unless the bird is displaying or engaged in chasing off a rival. There is no risk of confusing the females of the two species, as *C. habessinicus* has uniformly colored underparts while *C. mariquensis* has heavy dark mottling on the throat, breast, and flanks.

The race *turkanae* may be identified in the field by its very conspicuous, broad red breast band. There is no danger of mistaking the male for *Cinnyris mariquensis* as is possible with the nominate race. *C. h. alter* appears noticeably larger than the other two African races. Under certain conditions the golden sheen of the male's upperparts is very striking in the horizontal light of early morning.

The only living examples of *hellmayri* that I have seen were near Aden, when I was struck by the dark appearance of their underparts; the obscured red breast band was not conspicuous. The only other sunbird at all similar which occurs within the range of *hellmayri* is *Cinnyris osea*, a much smaller bird without a red breast band and with orange-red and yellow pectoral tufts. In the case of *kinneari*, judging from the appearance of study skins and my experience with the other races, it is probable that the narrow red breast collar is more noticeable in the field than the wider but much darker breast band of *hellmayri*. The very dark female of *kinneari* should also be recognizable alive.

*Vocalizations.*—There would appear to be little or no geographical variation in the call notes and song of *Cinnyris habessinicus*, but I gained the impression that the call notes of the male of *alter* were louder and clearer than those of males of other races. The calls and song of *kinneari* have not been recorded.

The usual call in all races is either a rather sharp *tsp, tsp, tsp*, each note uttered separately, or a less harsh *tss tss tss tss*, in which the notes are more or less run together. The latter call is very like that of another sunbird, *Hedydipna platura*. The male also has a loud, single call note, usually heard just before the bird takes wing. The adult male has an attractive warbling song which often is delivered from the topmost branch of a thorn tree. It starts with a series of quickly uttered notes, *ch ch ch ch ch*, and is followed by two or three rather long, drawn-out single notes, *chee-chee-chee*, with an appreciable break between each; this is repeated over and over again. The female has a low sub-song, a soft warble, usually delivered from among the foliage of a tree or shrub.

*Display.*—The display of *Cinnyris habessinicus* commences with the male drawing himself into a very upright attitude with the plumage compressed; this is followed by a quick shuffle along the branch toward the female, at which time he sways his body quickly from side to side and suddenly expands his feathers and fans out his pectoral tufts. In every display that I have watched, the female appears to take no notice whatsoever of the male and continues to feed until his movements bring him too close, when she flies off, with the male in quick pursuit. I have never seen the female give any encouragement to her suitor. At times a second male will alight in the same tree in which a displaying male is present, but he is soon chased off in no uncertain fashion. A single male will sometimes stop in the middle of a display, fly straight up into the air for a few feet as if fly-catching, and then return to his original perch and burst into song. This "fly-catching" interruption was often observed in northern Kenya, but it was not noted in the case of *alter*. Except when displaying or about to display, the male appears to be fairly tolerant of the presence of potential rivals and I have several times watched four or five males feeding together in the same flowering tree.

*Breeding seasons.*—On the maritime plain in Eritrea the nesting of *habessinicus* coincides with the winter rainfall in December and February, as in most species of birds on the coast (K. D. Smith, *in litt.*). On February 2, 1951, Mr. Smith encountered a single fledgling being fed by an adult. At higher altitudes the breeding season may be later, or more prolonged, as Mr. Smith flushed a female from a nest containing a clutch of one on June 10, 1951. He wrote to me as follows: "For some reason the general breeding season on these slopes [the plateau escarpment some twenty miles inland from the mari-

time plain] seems to take place in Spring—April to June—whereas it commences on the maritime plain as early as December, when the first rains fall. Why exactly I do not know; both areas have their main rainfall in winter and there seems to be no logical reason why breeding should be delayed on the slopes. June seems a late date; the trees then were almost leafless and conditions apparently [were] unfavorable for raising a brood." Adults in full breeding condition were collected by Mr. Smith near Massawa, on the maritime plain, on December 24 and 30 and January 1, and on the Eilet Plain, 800 feet, in eastern Eritrea, on March 5 and 7.

In the Northern Frontier District of Kenya Colony the nesting season of *turkanae* is rather lengthy. Basing my conclusions on nests found, the presence of recently fledged juveniles, and the condition of gonads in adult specimens collected, I estimate that breeding starts during April, perhaps exceptionally in March, and continues until late June or early July, with a peak period during May. This breeding season coincides with the long rains. An adult male with gonads in full breeding condition was collected at Malka Murri on the Daua River as late as June 29. In southern Italian Somalia adults collected during February had gonads commencing to enlarge, so breeding probably takes place there during the same period as in the Northern Frontier District of Kenya. The same would apply to southeastern Ethiopia. In Turkana and southeastern Sudan, and probably also in southwestern Ethiopia, the breeding season of *turkanae* is shorter, extending from early May to early July. A few adults collected in Turkana during the first week of May were not quite in full breeding condition. Nests containing the full clutch of one egg were found in Turkana on May 6 and 10.

The breeding season of *alter* varies according to altitude. Birds in the highest zones commence breeding during April and May, those occurring between 4000 and 5000 feet start nesting during February and March, and those at lower altitudes down to sea level begin nesting in January, and perhaps even in December. An adult male collected by Mr. George Popov at sea level near Berbera on December 29 was in full breeding condition. The duration of the breeding season varies between three and four months, judging from gonad development in specimens collected.

The race *hellmayri* breeds from late March until May, on the evidence of immature and juvenal birds, and *kinneari* also nests at this time. Meinertzhagen (1954) recorded a nest of the latter under construction at Birka in early April, and the gonad development of an adult male collected at Sail on March 3 indicated that breeding would have occurred within four to six weeks. Bates (1930) stated that "in February these sunbirds seemed about to begin breeding."

*Nesting sites and nests.*—The nesting site chosen by *Cinnyris habessinicus* is in a thorny tree or shrub, the nest being attached to and suspended from the middle of a sloping branch. Often it is placed high up in the center of a tree, surrounded by other branches. The site may be from four or five to over twenty feet above the ground, but most nests are between ten and twelve feet up. In the more than 30 nests that I have examined the entrance faced toward the center of the tree or bush in which it was situated. Nests may be placed in exposed positions or hidden among surrounding foliage.

I have examined the nests of all races of *Cinnyris habessinicus* with the exception of *kinneari*, and I find that nest construction and materials used do not vary geographically. The nest is an oval or pear-shaped structure, measuring about 4½ inches long by 3 inches maximum width, attached to a sloping branch by means of a bulky support at the top of the nest dome (fig. 5). The reinforced supporting structure is continued along the branch to above the entrance, which is located at one side near the top and is protected by a well-marked porch. The round entrance faces in toward the middle of the

tree immediately below the support structure. Externally the nest is composed mainly of a curious silvery-gray plant fiber, with some strands of withered, soft grass, a few dead leaves, and some old insect cocoons, the whole woven together with spider web and insect silk. The external plant fiber imparts a unique silvery sheen to the nest, which at a distance has a marked resemblance to the nest of some wasps. The inside is very thickly lined with either orange-tinted plant wool from the seeds of *Ipomoea* or, sometimes, the paler colored seed down of *Calotropis*. Meinertzhagen (1954), in his description of the nest of *kinneari*, stated that some tiny feathers were present in the lining in addition to plant wool.

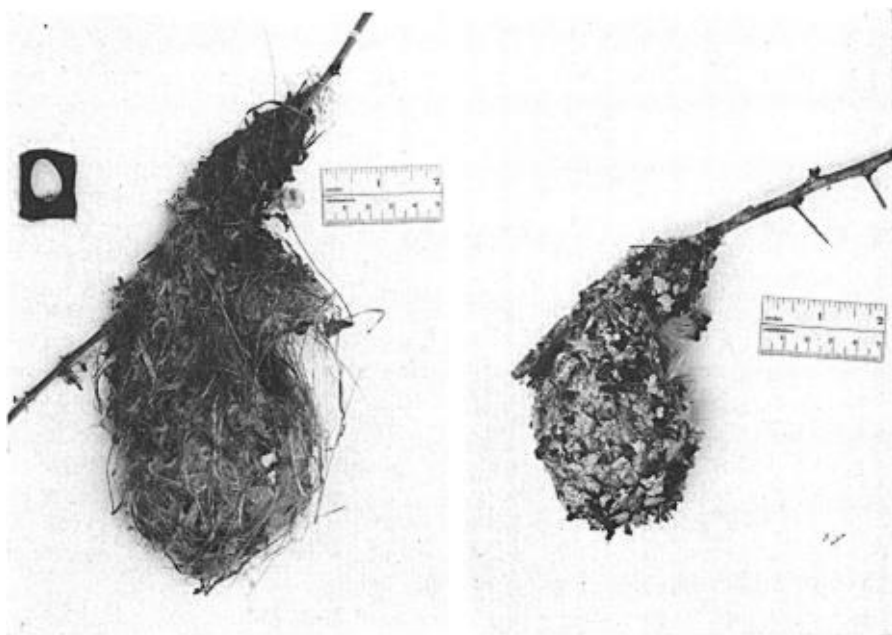


Fig. 5. Nest and egg of *Cinnyris habessinicus turkanae*. Photograph by J. S. Karmali.

Fig. 6. Nest of *Cinnyris mariquensis suahelicus*. Photograph by J. S. Karmali.

In general shape the nest of this sunbird is very like that of *Cinnyris mariquensis*, suggesting that the two species are allied; but the materials used in construction are very different. The nest of *Cinnyris mariquensis* (fig. 6) has the outer covering built up of flat pieces of greenish and gray lichen bound with spiders' web. Inside it is thickly lined with feathers, generally those of doves or francolins, which protrude from and conceal the entrance.

The nest of *Cinnyris habessinicus* is built entirely by the female, as are all sunbirds' nests that I have had under observation, but the male often accompanies the female to and from the nest during building operations. Both birds assist in the feeding of the single nestling.

Meinertzhagen (1954) made the very surprising statement concerning a nest of *kinneari* that "the male was more responsible for nest-building than the female." This, I feel, may have been a mistaken observation, due to the fact that the male is extremely noticeable during the female's nest-building operations, often accompanying her right up to the nest.

It is a constant source of amazement to me that even nowadays many of the accounts

of sunbirds' nesting habits still dismiss the nest with a few words such as: "pendulous nest of usual sunbird type." Actually, there is no such thing as the "usual type of sunbird's nest." Every species that I have studied has its own particular type of nest, with characters of shape, construction, and, generally, materials peculiar to the species. As an example, nests of *Anthreptes orientalis* have a characteristic loose weave and are always ornamented on the outside with at least a few old praying-mantis egg capsules. Species that are closely allied generally build nests that have much in common but differ in detail. I am convinced that a study of the nests of various sunbirds would do much toward our achieving a knowledge of the true relationships between various species of the family. To mention an example, it is now generally agreed that *Nectarinia nectarinioides* and *Nectarinia erlangeri* are conspecific and that the latter has no very close relationship with *Nectarinia erythroceria*, to which it bears a superficial resemblance. This is confirmed by the fact that the nests of *nectarinioides* and *erlangeri* are indistinguishable and quite unlike the nest of *erythroceria*. In turn, the nests of *nectarinioides* and *erlangeri* somewhat resemble those of the *Nectarinia pulchella-melanogastra* group, indicating a relationship, although not conspecific, which also is confirmed by the plumage characters of these birds.

*Description of eggs.*—So far as we know the complete clutch of *Cinnyris habessinicus* consists of one egg only. The eggs of the two Arabian races are at present unknown.

Altogether I have examined six occupied nests of *turkanae*, two of which contained one egg and four in which there was a single nestling. The eggs are slightly pointed ovals with a little gloss. The ground color is white; one has a zone of pale mauve-gray with superimposed blackish markings around the larger end; the second lacks most of the mauve-gray cap and is more sparingly marked with black. Measurements of the two eggs examined are  $19 \times 13.5$  and  $19.5 \times 14$ . The single occupied nest of *alter* I have found contained a single egg on the point of hatching. It was pointed oval in shape with a slight gloss, white in ground color, and with several large blotches of pale grayish-brown and a few overlying scrawls of black at the large end. It measured  $19.5 \times 15$ . Unfortunately Mr. K. D. Smith did not collect the single egg of *habessinicus* which he found. This he describes as being white with brown smudges.

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*Coryndon Museum, Nairobi, Kenya Colony, March 10, 1955.*