

AVIAN SYSTEMATICS AND EVO-
LUTION IN THE GULF
OF GUINEA

THE J. G. CORREIA COLLECTION

DEAN AMADON

BULLETIN
OF THE
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INTRODUCTION

JOSÉ G. CORREIA, a cooper on the whaling brig "Daisy" during her now famous cruise to South Georgia in 1912, was instructed in the methods of preparing museum specimens by Dr. Robert Cushman Murphy. He has since collected, chiefly for the American Museum, in many parts of the globe. The present paper is based on a collection made by Correia and his wife in 1928 and 1929 on the islands of Fernando Po, Principe, and São Tomé, in the Gulf of Guinea off the west coast of Africa. Their field work was supported by the late S. Brinckerhoff Thorne, then a trustee of the American Museum. Representative collections were obtained on Principe and São Tomé. On Fernando Po, Correia was incapacitated by sleeping sickness, and his plans to explore the higher levels of Clarence Peak (Pico Santa Isabel) had to be abandoned. He thus missed many of the montane species but did add a number of birds to the list of the avifauna of Fernando Po. More important perhaps is the fact that he obtained fine series of many of the West African species described from Fernando Po by Fraser, Strickland, Jardine, Alexander, and other early ornithologists. Critical comparisons with mainland material were thus made possible.

The Correias did not visit Annobon, the only other island of any consequence in the Gulf of Guinea. Annobon is much smaller than the other islands but has a few interesting endemic land birds, all unrepresented in the American Museum.

Correia's collection was identified for cataloguing by Dr. James P. Chapin, but no report on it has ever been written. A few records were incorporated in the second part of Chapin's "The birds of the Belgian Congo," and others are included in the third and fourth parts of that work, which are still unpublished. Such a record is Chapin's statement that *Columba arquatrix sjöstedti* occurs on Fernando Po as well as on Cameroon Mountain. Dr. Chapin also advised Dr. David A. Bannerman of the presence in Correia's collection of such rarities as *Amaurorichla bocagei*, and this is duly noted in Bannerman's "The birds of tropical West

Africa." I sent a list of the species obtained by Correia on Principe and São Tomé to David Snow, who incorporated some of this information in his recent paper (1950) on the birds of these islands. Finally, one must mention the revision of *Chrysococcyx cupreus* by Moreau and Chapin (1951) in which a new race of the Emerald Cuckoo is described from Correia's collection.

Among those who have published general accounts of the ornithology of the Gulf of Guinea islands are Bocage, Salvadori, Alexander (Fernando Po), Bannerman (Annobon, São Tomé, Principe), and Snow (São Tomé, Principe). Fernando Po has been relatively neglected, for there has been no general account of which I am aware since Alexander's article of 1903. Bannerman's papers (1914, 1915) on Principe and São Tomé are much more up to date, particularly as supplemented in a few details by Snow. Nevertheless, it seems worth while to present here (see below) a list of the resident, non-marine birds of these two islands, as well as of Fernando Po, both to incorporate certain changes in specific or subspecific status suggested by the present studies and also to provide a reference list for the discussion of evolution.

Both Drs. Murphy and Chapin encouraged me to write the present report on the Correia collection. I am indebted to them and to other members of the staff of the American Museum for many suggestions during the course of the work. I have, of course, leaned most heavily upon Dr. Chapin, whose encyclopedic knowledge of African birds and voluminous notes were both placed at my service with characteristic generosity. Dr. David Bannerman of the British Museum was kind enough to send me his personal bound copies of his own and Salvadori's papers on the Gulf of Guinea avifauna. The eight volumes of Bannerman's "The birds of tropical West Africa" were used constantly, for they give diagnoses of all the West African species and subspecies. I am also indebted to Mr. David Snow of Oxford University and Mr. Derek Goodwin of the British Museum for various courtesies. In

America I was able to borrow comparative material through the courtesy of Mr. W. E. Clyde Todd (Carnegie Museum), the late James Lee Peters (Museum of Comparative Zoölogy), and Dr. Austin L. Rand (Chicago

Natural History Museum). The map was prepared for publication by Dr. Charles Vaurie. Dr. Chapin, Dr. Ernst Mayr, and Dr. R. E. Moreau read sections of the manuscript.

THE GULF OF GUINEA ISLANDS

FERNANDO PO, PRINCIPE, and São Tomé lie in the Gulf of Guinea on an arc of volcanic activity which includes Mt. Cameroon on the mainland and which extends beyond Principe to include Annobon Island and possibly even the distant St. Helena. Geologically these islands are of volcanic origin. Some biologists believe that they represent volcanic elevations on a peninsula which was once connected with the mainland. So far as Fernando Po is concerned, there can be no reasonable doubt that it was connected with the mainland in the not too distant past. It lies on the continental shelf, only 32 kilometers from the coast. The greatest depth separating it from the mainland is about 60 meters (Exell, 1944, p. 5).

As regards Principe, São Tomé, and Annobon, however, the present view, again expressed by Exell, is that "All the evidence tends to show that the three islands never had any land connections either with each other or with the continent. They are isolated, moreover, by ocean depths of over 1800 metres." Since the volcanic activity that gave rise to these islands (and to Mt. Cameroon) is believed to have occurred in the middle or late Tertiary (there is still some slight active vulcanism on Fernando Po and São Tomé), there is no reason to think that changes of sea level of a magnitude necessary to unite these outer islands with the mainland have occurred since their origin.

The biogeographical evidence fully supports the above views. Fernando Po has an essentially continental biota, with endemism (at least in the birds) almost entirely confined to the subspecific level. The island has some endemic mammals, including monkeys and a small antelope (Krumbiegel, 1943). The outer islands, on the other hand, are said by Exell to have lacked endemic mammals other than bats. This is excellent evidence that they were never connected with the mainland. The floras, too, have an "insular character" (Exell, *op. cit.*, p. 5), and the avifauna has the unbalanced and impoverished yet highly endemic aspect usual in islands that have always been well isolated.

The distances between these various land units are as follows:

	KILOMETERS
Fernando Po to coast of the Cameroons	32
Fernando Po to Principe	220
Principe to São Tomé	146
Principe to mainland	220
São Tomé to mainland	280
São Tomé to Annobon	180
Annobon to mainland	340

Fernando Po is a rectangular island with dimensions of 69 by 32 kilometers. There are extensive mountains at each end, the highest mountain, called Clarence Peak or Mt. Santa Isabel, being 2850 meters high. Fernando Po is almost covered by rain forest, but there are some natural grasslands at moderate elevations near Moka, while approximately the highest 1200 meters of Clarence Peak is covered by grassland and heather. Nevertheless, these grasslands are evidently too small or too recent to have made much imprint on the avifauna. The few open-country birds that have been attracted by them, such as *Linurgus olivaceus olivaceus* and *Saxicola torquata pallidigula*, usually do not differ even subspecifically from the forms occupying the more extensive grasslands of Mt. Cameroon and the other Cameroon highlands. Even among the forest birds there is little taxonomic zonation into tropical and subtropical forms. Among the latter are such species as *Columba arquatrix sjostedti*, *Phyllostrephus poensis*, *Cyanomitra oritis poensis*, and others, most of which do not differ subspecifically from Mt. Cameroon representatives of the same species. Since Correia barely entered the highlands, it is precisely these highland forms that are usually lacking in his collection. Some of them are represented in the American Museum by a specimen or two taken by Alexander, but in general the systematic and other remarks on Fernando Po birds in this paper are restricted to the lowland species.

Perhaps the best general account of Fernando Po and its history is the chapter by the botanist Mildbraed in volume 2 of the popular account of the Duke of Mecklenburg's expedition called in the English edition, "From the Congo to the Niger and the Nile" (1913). (See also Exell, 1944.) A shorter

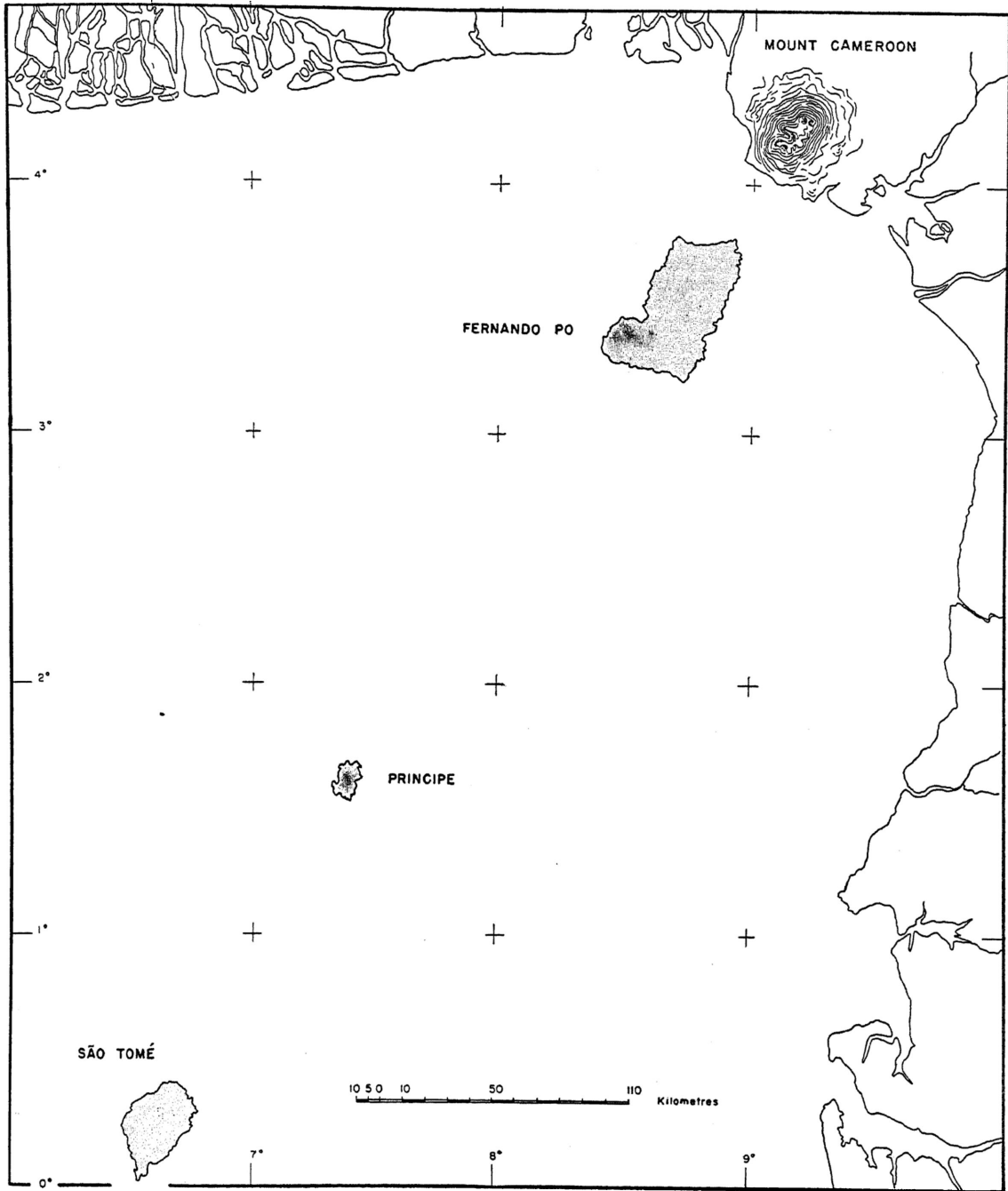


FIG. 1. Map of the Gulf of Guinea islands.

account of the island, with bibliography, is to be found in Alexander's (1913) paper on the birds he collected there. Barns (1928, pp. 31-32) wrote of the climate: "Owing to its position in a corner of the Gulf of Guinea, and to the influence of the fog and mist formed on the great mountain mass of the Peak, Fernando Po has a somewhat specialized climate differing considerably from that of the mainland close by . . . July to October are the wettest months of the year, but exactly the opposite holds on the mainland and in a somewhat lesser degree on the other Guinea Islands." Mildbraed (1913, p. 243) wrote of his experiences on Clarence Peak: "We suffered enough from cold and wet on the volcanoes near Lake Kivu [Kivu, in the Belgian Congo], but never anything like what I went through in Fernando Po. As a matter of fact the thermometer never fell below 54° F., but even this was a great contrast to the temperature of the West Coast [of Africa]." In the lowlands of Fernando Po the climate is, of course, more tropical.

Principe, a much smaller island than Fernando Po, is about 17 kilometers long and 8 kilometers wide; the area is only 126 square kilometers. The greatest elevation is 948 meters. It is believed to have been formerly an almost or entirely wooded island. There is little in the avifauna to disagree with this. The few grassland birds are mostly weavers, either known introductions or non-endemic forms which may have reached the island through natural dispersal after it was somewhat opened by cultivation. Barns wrote: "For an equatorial island Principe has a remarkably cool climate, almost bracing. . . ." Although some of the endemic birds of Principe are at present apparently confined to the highlands, it is doubtful whether the altitude was sufficient to induce very much altitudinal zonation under original conditions. Snow found the principal habitats on Principe to be (a) plantations, of several types, (b) lowland forest, one patch remaining, and (c) hill forest.

São Tomé is an island about twice the size of Principe, or 47 by 27 kilometers, with an area of about 1000 square kilometers. There

are many greatly dissected and eroded volcanic peaks, the highest of which reaches 2024 meters. At present this island is said to give the appearance of being almost uniformly forested, but much of the lower cover is formed by a scattering of shade trees in plantations of cocoa. It is commonly assumed that São Tomé was originally entirely forested, but Dr. Chapin has emphasized to me that the presence of such well-differentiated endemics among grassland or savanna birds as *Prinia mollerii*, *Lanius newtoni*, and *Ploceus grandis* indicates that there has always been some open country on this island. It is far enough from the coast to have a more pronounced wet and dry season than Principe or Fernando Po. The mean rainfall of São Tomé is said by Exell to be about 100 cm., which is not tremendous. It is not impossible therefore that some of the grassland weavers of São Tomé, in particular *Estrilda (perreini) thomensis* and *Euplectes aureus*, are true endemics, though, as noted in the taxonomic section, there is some question about the status or origin of most of them, including the two mentioned.

Snow lists the principal habitats on São Tomé as (a) coastal plantations, (b) mountain plantations, (c) steep, uncultivated, overgrown mountain sides, and (d) mountain mist forest above 5000 feet. It is quite probable that several of the São Tomé endemics, such as *Columba thomensis*, were restricted to the higher elevations even before the lowland forests gave way to plantations. In the absence of any ecological notes or indication of altitude on the labels of the specimens I have studied, together with the fact that I have never visited these islands, discussion in this paper has of necessity been limited to topics for which such information, however desirable, is not absolutely essential.

The isolated little island of Annobon to the southwest of São Tomé is only 7 kilometers long and 2½ kilometers wide, but like the others it is volcanic and despite its small size reaches an elevation of over 600 meters. For the sake of completeness, the birds of Annobon are listed with those of the other islands in a later section of this paper.

SYSTEMATIC NOTES

HYDROBATIDAE

STORM PETRELS

Oceanodroma castro castro Harcourt

The Madeira Petrel nests on the islands of the eastern Atlantic from Madeira to St. Helena and Ascension. Bocage recorded a specimen taken off the shores of São Tomé, and Correia obtained four at the south end of that island (November 15–December 14). One of them had the gonads large. This petrel may nest on islets off the coast of São Tomé. Correia's specimens have wing lengths as follows: males, 156, 160, 160; female, 171. The last is unusually large; the nearest approach I find to it among 37 adults from other parts of the range is a male from the Cape Verde Islands with wing 165.

PHALACROCORACIDAE

CORMORANTS

Phalacrocorax africanus africanus Gmelin

Correia obtained two specimens of the Long-tailed Cormorant in non-breeding plumage in June and July and a series in more or less complete breeding plumage with enlarged gonads in November and December, all from São Tomé. They seem to be inseparable from mainland specimens but may average smaller. The largest males from São Tomé have wing length 212, while adult males from the mainland usually have wing of about 220.

ARDEIDAE

HERONS

Butorides striatus atricapillus Afzelius

Correia secured adults and immatures on São Tomé and Príncipe, and we have half a dozen additional specimens from the former island taken by Mocquerys. They agree with specimens from various parts of Africa. This race is not very different from the races of Asia, and connections are provided by the forms of Madagascar, the Seychelles, and other islands in the Indian Ocean (and probably in the not distant past by a continuous population through the now desiccated Middle East). The race *atricapillus* is very much like nominate *striatus* of South America, if indeed the two can be separated. Since the

species shows considerable geographical variation in south Asia and the Australian region, the evidence would indicate that it spread over Africa rather recently and then succeeded in colonizing South America from Africa. In Panama and Central America it met the rather different races of the North American *virescens* group. The latter presumably reached the New World via Asia, and much earlier, for at present the population of northeastern Asia and Japan (*amurensis*) resembles populations of Asia and shows no particular affinity to *virescens*. If this analysis is correct, *Butorides striatus* is to be added to the small list of primarily fresh-water birds that have succeeded in crossing the South Atlantic (*Dendrocygna viduata*, *Dendrocygna bicolor*, *Netta erythrophthalma*, *Larus cirrocephalus*, and presumably *Bubulcus ibis*). For *Butorides* the evidence indicates that the crossing was made from Africa to America, and the same, of course, would be true of the Cattle Egrets (*Bubulcus*) now established in northern South America, unless they are escapes.

Bubulcus ibis ibis Linnaeus

Our specimens came from São Tomé. In much of West Africa the Cattle Egret is a migrant visitor, leaving to nest in the Sudan and adjacent areas in the Northern Hemisphere spring (Chapin, 1932, pp. 430–432). In South Africa it nests at the opposite season, October and November. The herons of this species found on São Tomé could be migrants from the north, but the seasonal occurrence of their ornamental plumes rules out this possibility in the opinion of Chapin. Specimens taken in June were without plumes or were just beginning to acquire them. Two December birds had fully developed but somewhat worn plumes; the gonads were "large." This evidence, based on some dozen specimens, suggests that there is a resident population of Cattle Herons on São Tomé, the nesting season of which corresponds with that of the South African colonies. On this equatorial island the nesting season may be more protracted than in the other regions mentioned.

Egretta gularis gularis Bosc

This is a bird of the coasts of tropical West Africa, though it has been taken in Nigeria on flood plains some distance inland. Correia secured it on São Tomé, Príncipe, and Fernando Po. From the mainland we have four specimens.

Seventy-nine years ago Reichenow (1874, p. 380) stated that *gularis* has a white phase, yet various recent authors (including Bannerman, 1930–1951, vol. 1, and Steinbacher, 1936) have stated that a white phase is unknown.

There may be regional differences in the percentage of gray and white birds. Exactly half of our 20 specimens from São Tomé are white, but all the others (five from Príncipe, two from Fernando Po, and four from the mainland) are gray. The Reverend A. I. Good found the white phase not uncommon on the Cameroons coast (letter to J. P. Chapin) and collected some white birds now in the Cleveland Museum. Many observers have listed all egrets of this general type seen in West Africa as *Egretta garzetta* in the erroneous belief that *gularis* has no white phase. This casts doubt on Snow's record (1950) of *garzetta* from São Tomé, the first for the island. Though the heavy yellowish bill of *gularis* should distinguish it from adults of *garzetta*, it is not always easy to separate them. Chapin tells me he was unable to be sure to which of the two species some white egrets he saw at Lagos, Nigeria, belonged.

No specimens that can truly be called intermediate between the gray and white phase were examined, unless the presence of whitish mottling or ill-defined whitish areas on the primaries can be so considered. Immature birds of the gray phase are lighter, more dingy, than adults, and may even be whitish on the abdomen. This is in part the result of bleaching and fading which, as often is the case, are greater in immatures than in adults. Dark-phase birds occasionally have a few white feathers on the forehead or above the eye. This does not seem to be correlated with the presence of white on the primaries but may, nevertheless, reflect a not quite complete genetic or developmental segregation of the two phases. This is further suggested by the occurrence in the Aldabra

Island population of *E. dimorpha* (see below) of dark-phase birds with considerable white on the head and neck that does seem to be associated with extensive white on the primaries.

White-phase *gularis* sometimes have a few scattered grayish feathers on various parts of the body. Two such birds are marked as having the gonads in breeding condition, but their nuchal plumes are rather poorly developed. White birds in full breeding dress do not, in the sample examined, have any gray feathers. It is probable, therefore, that white-phase immatures may be speckled with gray which disappears with maturity. This is the situation in *Egretta sacra*, another reef heron (cf. Mayr and Amadon, 1941). It is possible, of course, that some white-phase *gularis* do retain a few gray feathers throughout life. It will be recalled that in *sacra* mottled adults are found in certain areas of Polynesia, though unknown from most of the range of the species.

Bannerman (1930–1951, vol. 1, p. 70) described two phases of gray *gularis*. I am unable to verify his remarks in full but do find two types. One, the more common, has the greater wing coverts white; in the other these feathers are dark and the plumage in general is perhaps more blackish. This phase, if such it is, is represented by two birds only, both males, one from Portuguese Guinea and one from Príncipe. Bannerman found that only five of 17 gray examples from the mainland had white wing coverts, whereas all those from the islands did. Of five specimens taken by the Danish expedition to West Africa in Liberia and Nigeria, all were gray. Three of the five had the wing coverts gray like the body, and in a fourth they were gray on one wing and white on the other (Wolff, 1950). There can be little doubt that birds with gray coverts are commonest on the mainland, although three of the four birds from the mainland examined by the writer had white coverts. The specimen from Príncipe with gray coverts, mentioned above, proves that this variation does occur in the insular populations.

Our material does not suggest geographical size variation within the range of *gularis*. As noted by several writers, the tarsus length of this heron (and of some of the related

forms) varies greatly, so that if extremes, even within a sex, are compared one might at first believe that two species are involved.

Mrs. Correia visited a nesting colony of *Egretta g. gularis* on Goat Island, off the shores of São Tomé, on August 7. She found that of 25 nests, 23 contained one egg and the remaining two nests had two eggs each. Since all the eggs she collected were fresh, it is possible that egg laying was just beginning and that the usual clutch is larger than suggested by these figures. Indeed, Bannerman says the clutch is three or four eggs. Seven eggs taken by Mrs. Correia average 43.1 by 32.3. A nest that was collected is rather substantially built of sticks. It was placed 10 feet high in a tree.

RELATED FORMS: The West African Reef Heron (*gularis*) is replaced on the northeast coast of Africa by the very similar *E. gularis schistacea* (synonym: *asha*) which ranges from Somaliland and even Lake Albert and the Nile River through the coasts of the Red Sea, the Persian Gulf, and the Indian Ocean south to Ceylon. *E. g. schistacea* is somewhat larger than *gularis*, and the gray phase (of which I have not seen the adult) is said to be lighter. Both *schistacea* and *gularis* have rather heavy bills, with a somewhat curved culmen. A narrow open space remains between the mandibles even when the bill is closed. In this and in their reef-frequenting habits and dimorphic plumages, they agree with *Egretta sacra*. The three have, of course, often been placed in a separate genus, *Demigretta*.

Others, noticing that *schistacea* and *gularis*, like *E. garzetta* and unlike *sacra*, have two long plumes on the nape and specialized aigrettes on the back, place them in *Ergetta* and even go so far as to treat them as races of *garzetta*. I agree that *gularis* and *schistacea* are closer to *garzetta* than to *sacra* but think they are best kept as a species. The bill of *schistacea* and of *gularis* differs from that of *garzetta* not only in shape but in color.

Another related heron, *Egretta dimorpha* of Madagascar, is dimorphic, and some, misled by this, have considered it to be nearer to *gularis* and *schistacea* than to *garzetta*. Hartert (1925, p. 271) correctly emphasized that *dimorpha* is closer to *garzetta*, of which it may well be a race. Both have a slender black bill

and specialized aigrettes. *Dimorpha* is apparently a typical egret in habits and less partial to coastal lagoons than are *gularis* and *schistacea*, except perhaps on Aldabra and Assumption where it must, perforce, be chiefly a reef dweller.

In view of the difference in nuchal plumes, it is possible that *Egretta sacra* is related not to the African Reef Herons (*gularis*) but to the Chinese Egret (*E. eulophotes*). Although the latter is a fresh-water egret with thinner bill and legs and slightly more specialized plumes, it has often been confused with the white phase of *sacra* (Amadon, 1951), which it links with the more typical egrets. The American Snowy Egret, *Egretta* ("Leucophoyx") *ihula*, has a tuft of plumes on the nape rather than two long strap-like plumes and may be closer phylogenetically to *eulophotes* than to *garzetta*, despite its great general resemblance to the latter.

MEASUREMENTS: Males of these herons are larger than females. Yet there is overlap in the size of the sexes, and one finds many doubtfully sexed or unsexed specimens, so it is perhaps best merely to list inclusive measurements for both sexes. *E. g. gularis* is enough smaller than *schistacea* to permit separation, as a rule, without comparison sex for sex. Whether white examples of *dimorpha* can always be separated from representatives of the other races of *garzetta* by measurements is more doubtful. The present purpose is merely to compare the proportions of these races of *garzetta* with those of *gularis*. The measurements of *schistacea* (four specimens only) and *gularis* were taken by the writer; those of the other forms are from Hartert.

	WING	CULMEN	TARSUS
<i>E. gularis gularis</i>	251-287	78-91	72-97
<i>E. gularis schistacea</i>	263-303	86-102	95-111
<i>E. (garzetta) dimorpha</i>	281-309	94-103	100-117
<i>E. garzetta garzetta</i>	265-300	78-92	87-113

THRESKIORNITHIDAE

IBISES

Bostrychia (olivacea) bocagei Chapin

This interesting dwarf form, endemic to São Tomé, was previously known from five specimens in Paris and Lisbon. Correia secured one, an adult female taken near the

south end of the island at an elevation of 3500 feet. It measures: wing, 250? (primaries broken), culmen, 75, and thus agrees in size with the other known specimens, the measurements of which were tabulated by Chapin (1923, p. 9). It is a matter of opinion whether *bocagei* is treated as a race of the much larger *olivacea* or as a representative species (see pl. 1).

The other races of the Green Ibis are *rothschildi* (Principe Island), *olivacea* (Upper Guinea), *cupreipennis* (Lower Guinea), and *akeleyorum* (Mt. Kenya and other near-by mountains). I have seen no specimens of *olivacea* or *rothschildi*; the latter is probably extinct. Two specimens of *cupreipennis* and four of *akeleyorum* agree in color, and that our specimen of *bocagei* appears browner dorsally may be owing to the condition of its plumage. Taxonomic comparisons in this rare species have been restricted to single specimens, usually ancient mounts, so that alleged color differences require confirmation. It is possible that the three medium-sized races, *olivacea*, *rothschildi*, and *cupreipennis*, are one and the same. *Akeleyorum* is much larger, though the difference is not so great as is that shown by *bocagei* in the other direction.

I prefer to include in the genus *Bostrychia* the four African ibises usually referred to as *Bostrychia carunculata*, *Lampribus rara*, *L. olivacea*, and *Hagedashia hagedash*. The Wattle Ibis (*carunculata*) of Abyssinia bears a great resemblance to "*Lampribus*" *olivacea*, the type of *Lampribus*. The two are similar in size and proportions, and their coloration is similar, even to the presence of a whitish malar area. The circumorbital areas and lores are bare in *olivacea* (and *rara*) but feathered in *carunculata*. The latter species has a narrow unfeathered area running down the throat and culminating in a small wattle. I do not think these differences are of generic value in species otherwise so similar and so closely related.

The similarity of *olivacea* to the Hadada Ibis ("*Hagedashia*" *hagedash*) is very striking, the principal difference being that the latter has a very slight crest, while *olivacea* has a full one. The two species have similar habits and call notes (Chapin, 1932, pp. 474-484). Both are in part crepuscular in habits.

The Crested Ibis of Madagascar (*Lophotibis cristata*) is related to the species discussed above but is somewhat more specialized as regards crest and coloration. The anterior surface of the tarsus is covered by transverse plates, which only occasionally are broken up into weak reticulations, whereas the tarsi of the four species here placed in *Bostrychia* are reticulate. *Lophotibis* may be retained at least until such time as a general revision of the Threskiornithidae is attempted. The Neotropical *Theristicus* may also be related to *Bostrychia*.

The forms discussed above, with the exception of *Lophotibis*, are represented in plate 1. It may be noted that *Bostrychia (olivacea) bocagei* and *Bostrychia carunculata* have a long crest like that of *B. o. cupreipennis* and *B. o. akeleyorum*, although this is not very evident in the specimens shown on this plate.

Bostrychia hagedash brevirostris Reichenow

Correia collected examples of the Hadada Ibis on Fernando Po, and we have one collected there in 1904 by E. Seimund. The adults in this series measure: wing, males, 351, 352, 353; females, 336, 339; culmen, males, 149, 153, 161; females, 145, 153. These measurements appear to average slightly larger than those of mainland examples of the West African race as given by Neumann (1909, p. 196), and others measured by the writer. Neumann listed one bird from the Cameroons with bill 165, and Chapin (1932, p. 478) mentions one from the Gaboon with bill 160, so the measurements of the islands birds are equaled by some from the mainland.

In the eastern Belgian Congo the length of the bill averages longer and the coloration slightly paler. Such specimens are intermediate towards *nilotica* Neumann (type examined), a form which is best developed in Abyssinia, whence some specimens are strikingly large (wing up to 393). *B. h. erlangeri* of the more coastal areas of eastern Africa, from Somaliland south, is a still paler bird with medium bill (like *brevirostris*). To the south *erlangeri* intergrades with the very short-billed and pale nominate race of South Africa.

The type of *brevirostris* Reichenow from

the Cameroons, examined by J. P. Chapin, is an immature bird, hence its short bill. The name antedates *guineensis* Neumann (type examined) from Nigeria.

Bostrychia hagedash occurs on the mainland in the same general areas as the rarer *B. olivacea*, though preferring less wooded habitats. On the islands in the Gulf of Guinea the two species may replace each other. It is possible, of course, that *olivacea* occurs on Fernando Po but has remained undetected.

ACCIPITRIDAE

HAWKS

Milvus migrans parasitus Daudin

SYNONYM: *Milvus migrans tenebrosus* Grant and Mackworth-Praed, 1933.

The Black Kite is common on São Tomé, whence we have good series taken by Correia and Mocquerys. March, June, and July adults had large gonads; birds taken in December, small ones. We have immature specimens taken in May, June, July, and October.

Grant and Mackworth-Praed described *tenebrosus* (type locality, Ivory Coast) as being "much darker, more sooty and blackish" than *parasitus* (type locality, South Africa). They restricted *parasitus* to South Africa and believed *tenebrosus* to be the form found in the remainder of the Ethiopian region. They examined 46 specimens of "*tenebrosus*" but gave no indication as to what South African material they saw. Their description may have been in part prompted by Hartert's remark (1912-1921, p. 1173) that West African specimens of *parasitus*, by and large, average darker, less reddish, than others.

From South Africa we have the following: Cape Colony, two; Natal, two; Transvaal, four. Although we have no specimens from the Ivory Coast, we have good material from elsewhere in West Africa, including specimens from Sierra Leone, Nigeria, Senegal, Liberia, Belgian Congo, and the series from São Tomé. Chapin and I were quite unable to perceive any difference in these birds, apart from great individual variation. Nor are birds from East Africa, north even to Somaliland and Eritrea, perceptibly different.

At first glance our immature birds from

São Tomé appear very dark, but examination of a large series from other parts of Africa shows much variation. The immature plumage becomes noticeably lighter with age, probably through fading and bleaching. One bird from the Anglo-Egyptian Sudan and one from Abyssinia are quite as dark as birds from São Tomé. On the other hand, an immature from Senegal represents the light extreme of variation.

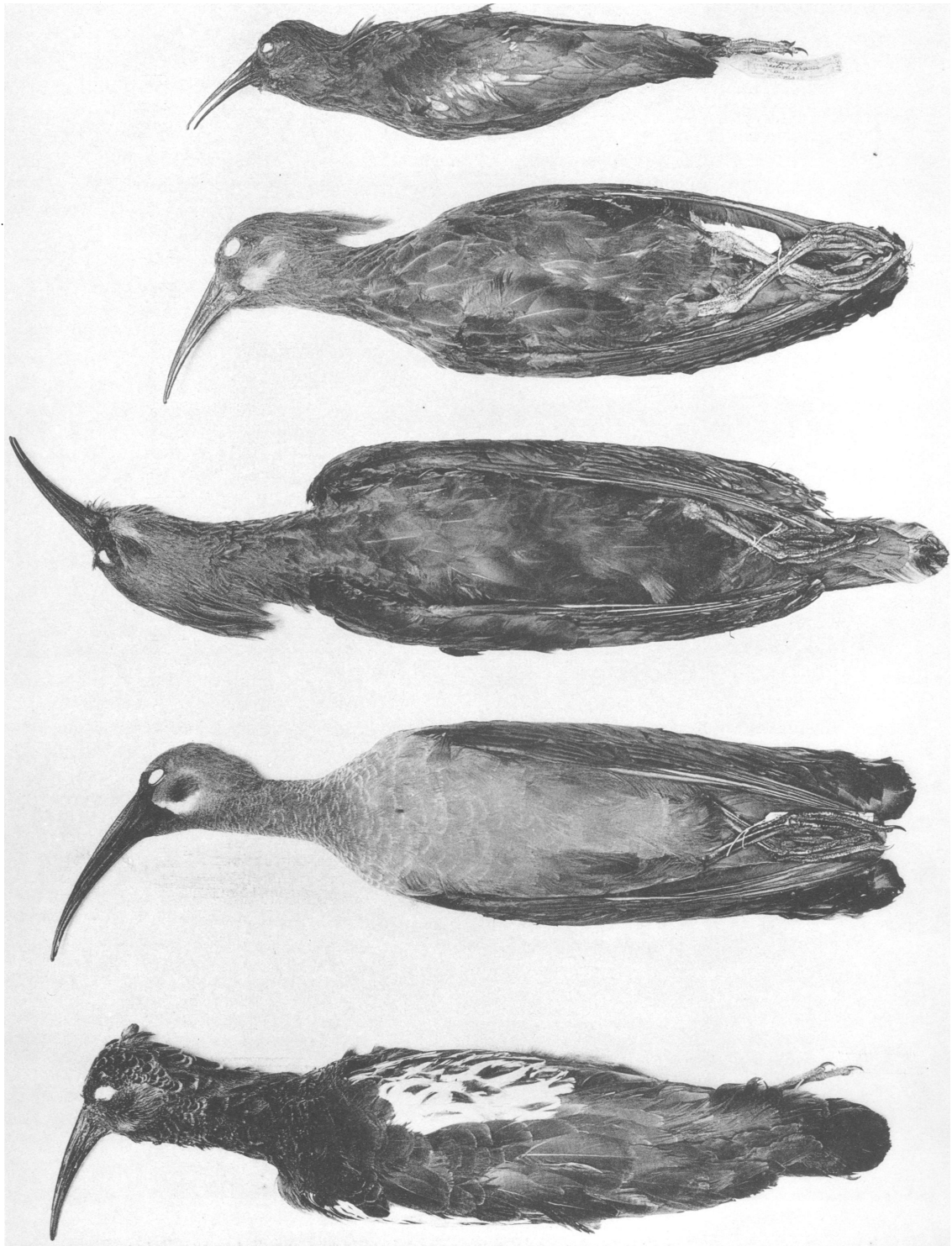
The evidence from both old and young birds thus indicates that West African kites cannot be satisfactorily separated from *parasitus*.

This kite is known from Fernando Po, but we have no material from there. On Principe it seems to be unrecorded.

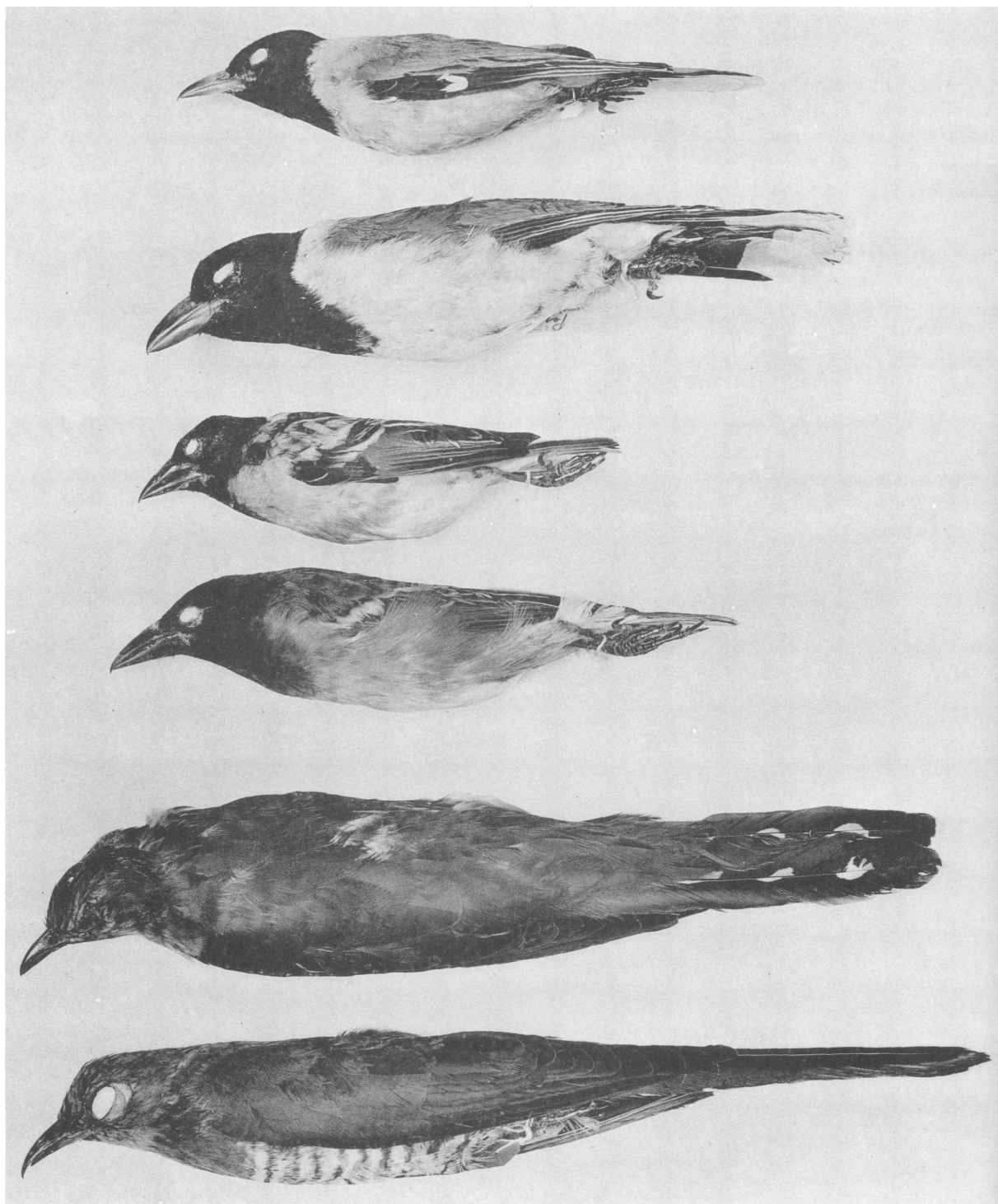
Accipiter tachiro lopezi Alexander

Endemic to Fernando Po. Correia secured an adult male in non-breeding condition on June 5. We also have a female in immature plumage secured by Alexander. Chapin examined and measured three more in the British Museum—the type, which is an adult male, and a pair of immatures.

The group of African accipiters of which this is a member provides a difficult problem in speciation. The pale and immaculate *canescens* of the Belgian Congo forests is replaced abruptly in the clearing along the edges of the forest by the heavily barred *sparsimfasciatus*. Both forms are said to have been taken at Buta, Belgian Congo, but *sparsimfasciatus* was presumably attracted to the clearing around the settlement, while *canescens* inhabits the surrounding forest. Chapin (1932) found no evidence of intergradation between the two forms and believed them to be species. If, however, one examines the forms to the west and north of the range of *canescens*, the situation is otherwise. *Toussenelii* of the Gaboon and eastern Cameroons is similar to *canescens*, but its under parts are not so pale, and there is an appreciable amount of gray barring on the mid-venter. In the next form, *macroscelides*, with type locality Gold Coast, the under parts are prominently barred with gray and white. The unmarked rufous areas are restricted (at least in the female, which is the only sex of which I have seen adults) to the sides and flanks.



Top to bottom: *Bostrychia (olivacea) bocagei*, *Bostrychia olivacea* "cupreipennis," *Bostrychia olivacea akeleyorum*, *Bostrychia hagedash brevisrostris*, and *Bostrychia carunculata*



Top to bottom: *Oriolus brachyrhynchus laetior*, *Oriolus crassirostris*, *Ploceus cucullatus cucullatus*, *Ploceus grandis*, *Cuculus solitarius solitarius* (Natal), *Cuculus solitarius magnirostris* (type)

Immatures of *canescens* are nearly white below (showing the same reduction of marking as do the adults) but have a few blackish spots on the sides. Those of *toussenelii* and *macroscelides* are somewhat more heavily marked, but the breast and abdomen remain immaculate white, or nearly so. This, indeed, is the easiest means of distinguishing immature males of *toussenelii* from immature females of *castanilius* (see below).

The immature plumage of *lopezi* is heavily streaked with blackish on the breast and barred on the sides. In this it goes a step beyond *macroscelides* (judging from one immature specimen only) but agrees well enough with the immature female of a geographically far removed race, *A. t. unduliventer*, of the highlands of Ethiopia. Indeed, I found little difference between the two, but the Fernando Po bird is somewhat more blackish above and has no whitish areas near the shaft of the rectrices. The adult male of *lopezi* resembles that of *unduliventer*. Both are extensively rufous below, but of a somewhat deeper shade in *lopezi*, which differs further in that the ventral barring is coarser.

In *unduliventer* one has arrived at a form not very different, except in smaller size, from *sparsimfasciatus*, mentioned above. The latter, in turn, is very similar to true *tachiro* of South Africa. Thus one finds complete intergradation in this group, but the

extreme forms, *canescens* on the one hand and *sparsimfasciatus* (and *tachiro*) on the other, are sharply separated ecologically and quite different in appearance. The intermediate forms are isolated in West Africa from *unduliventer* and *sparsimfasciatus*. It is possible, of course, that at one time *unduliventer* and *macroscelides*, or their forerunners, had a continuous range north of the forest, as Gurney, who did not differentiate between *unduliventer* and *macroscelides*, believed. I prefer to treat all members of the group as races of *tachiro*.

I give measurements of the few specimens of *toussenelii* and *macroscelides* examined (for other specimens, see Bannerman). The adult female of *macroscelides* is from the northwestern Cameroons. It is much larger than measurements I have found of this form in Bannerman and elsewhere and also much larger than our only other female of this race, an immature from Liberia. This Cameroons specimen agrees in color with descriptions of *macroscelides*, and Chapin tells me that he has observed that skins from this part of the Cameroons in the Pittsburgh Museum are *macroscelides*. Peters (1931-1948, vol. 1, p. 210) and others list *toussenelii* as the only form of this bird inhabiting the Cameroons. The measurements of one pair of *unduliventer*, *sparsimfasciatus*, *canescens*, and *t. tachiro* are given below for comparison with the other forms:

	WING	TAIL	TARSUS
<i>lopezi</i>			
♂ ad.	182, 189 (type)	159 (type), 160	60 (type)
♂ imm.	184	160	61
♀ imm.	214, 216	189, 199	70
<i>macroscelides</i>			
♂ imm. (Cameroons)	188	169	—
♀ imm. (Liberia)	211	193	—
♀ ad. (Zakbayeme, Cameroons)	246	212	—
<i>toussenelii</i>			
♂ ad.	198	167	—
♂ imm.	183, 188	158, 160	—
♀ ad.	221	194	—
<i>canescens</i>			
♂ ad.	186	157	—
♀ ad.	226	205	—
<i>unduliventer</i>			
♂ ad.	184	—	—
♀ ad.	216	—	—

	WING	TAIL	TARSUS
<i>sparsimfasciatus</i>			
♂ ad.	211	—	—
♀ ad.	252	—	—
<i>tachiro</i>			
♂ imm.	206	—	—
♀ ad.	245	—	—

RELATED SPECIES: *Accipiter castanilius* of the forests of Upper and Lower Guinea is very similar in coloration to some forms of *tachiro* (viz., *unduliventer*, *toussenelii*, and *lopezi*) but is a much smaller bird with, on the average, a relatively longer tail and tarsus; its toes are blackish, not yellow (Stresemann, 1926; Chapin, 1932, pp. 622-627). That *lopezi* belongs with *tachiro*, not *castanilius*, is evident from its size, proportions, and the color of the toes.

In an examination of the specimens of *castanilius* in the American Museum it became evident that three birds from the eastern Congo taken by Chapin are larger than 10 specimens from Gaboon (the type locality of *castanilius*), the Cameroons, and the coast of the French Congo. A specimen from Lukolela, farther west in the Belgian Congo, is intermediate in size, but nearer the larger eastern form for which the name *beniensis* Lönnberg (1917, p. 13), with type locality at Beni, Belgian Congo, is available. The larger size of *beniensis* is corroborated by Lönnberg's measurements of the type, an adult male (wing, 162; tail, 146), and by the measurements of a pair of adults in the Congo Museum in Belgium. These were supplied to me by Chapin, with measurements of other specimens in European museums, including those of the type of *castanilius* in London (wing, 152). I have also included the measurements of six immature and one adult females of *c. castanilius* published by Stresemann (*op. cit.*). There is no overlap in the measurements of the races sex for sex, even when those of birds in adult and immature plumage are united, but if larger series were available a few specimens would doubtless be found to overlap in size. The two forms, which seem to be identical in color, probably intergrade in the eastern Belgian Congo and perhaps the western French Congo. I am in sympathy with the present trend to suppress naming of continental races based on grad-

ual clines. In the present species, however, the variation is as great as in many in which clinal size races are currently admitted. Since no new names are required it seems preferable to recognize two races in *Accipiter castanilius* until opinion regarding such cases has crystallized.

	WING	TAIL
<i>castanilius</i>		
4 ♂ ad.	152-158 (155)	—
3 ♂ ad.	—	134, 135, 137
1 ♂ imm.	151	137
6 ♀ ad.	174-184 (178)	—
4 ♀ ad.	—	159-164 (162)
9 ♀ imm.	169-183 (176)	153-168 (161)
<i>beniensis</i>		
♂ ad.	162, 163, 167	141, 146
♀ ad.	190	169
♀ imm.	188, 190	173

Gypohierax angolensis Gmelin

The Palm Vulture occurs on Fernando Po, where Correia secured several specimens. They seem not to differ from a pair secured by Boulton in Angola, the type locality.

PHASIANIDAE

QUAIL, GUINEAFOWL

Coturnix delegorguei histrionica Hartlaub

There is no doubt that specimens of this quail from São Tomé average darker above than those from the mainland of Africa. *Histrionica* is valid. It was somewhat disconcerting, however, to notice that the only light-colored bird from São Tomé was our only old skin, and that a recently taken specimen from Northern Rhodesia is as dark as any of the island birds. Further study showed that many mainland birds, even though taken rather recently, are light in color. The differences mentioned are apparently in the main geographic and not a result of foxing. Correia's specimens, taken from May to July, were mostly in breeding condition. Females

of *histrionica*, as noted by Bannerman, have the under parts somewhat darker, deeper rufous, than in the nominate race.

Numida meleagris ?*galeata* Pallas

Bannerman (1930-1951, vol. 1, p. 348) was premature in saying that the guineafowl has disappeared on São Tomé, for Correia secured a male in 1928 and another in 1929. They show no evidence of domestication, though they were presumably introduced. These two specimens seem to agree as well with *marchei* as with *galeata*; the validity of the former requires confirmation. According to Bannerman guineafowl were unsuccessfully introduced on Fernando Po. Correia did not find them there.

RALLIDAE

RAILS

Crex egregia Peters

The African Crake has usually been placed in the monotypic genus *Crecopsis* Sharpe. In my opinion it may conveniently be placed in the genus *Crex* Bechstein, of which the Eurasian Land Crake, *Crex crex*, is the type and only other species. Both species have rather deep, compressed bills and short toes, the latter correlated with their preference for dry areas. The wing of the migratory *C. crex* is somewhat less rounded than that of *egregia*, but this is hardly a generic character. White (1951, p. 462) also concluded that *Crecopsis* should be united with *Crex*. I prefer, however, not to follow him in uniting *Porzana* with *Crex*.

Two specimens of *Crex egregia* from São Tomé, one of them taken by Correia, seem to be inseparable from specimens from Africa.

Gallinula chloropus brachyptera Brehm

Four specimens from São Tomé seem to differ in no way from the specimens from the mainland.

GLAREOLIDAE

FRATINCOLES

Glaucola nordmanni Fischer

We have one specimen of this Eurasian migrant from Principe, an immature taken on September 29. The only previous speci-

men from Principe was also taken in September. It has not been found on the other islands.

COLUMBIDAE

PIGEONS

Treron australis

It is Chapin's opinion that, with the exception of *T. waalia*, all the African mainland forms of *Treron* are races of *T. calva*. He is inclined to regard *T. australis* of Madagascar as specifically distinct from *T. calva*, but in view of the very considerable variation existing in the latter, I cannot quite see the necessity for this. Actually, *australis* is more like the race *calva* of West Africa than are some of the races of eastern and southern Africa.

Treron australis poensis Hartert and Goodson

This race, which is endemic to Fernando Po, differs from *calva* (Cameroons to the Loango coast) by having the under parts and head somewhat more yellowish. It is larger than *calva* but not so large and yellow as *ansorgei* of Angola.

Treron australis virescens, new subspecies

TYPE: A.M.N.H. No. 265941; adult male; north end of Principe Island; September 27, 1928; J. G. Correia, collector. Wing, 159; tail, 90; cere, 14; horny rhamphotheca, 14.

DIAGNOSIS: Like *T. a. calva* but under parts and head on average a deeper duller green, less yellowish. Cere perhaps smaller than in *calva*. In *virescens* the cere of breeding birds is about equal in length to the horny part of the bill; in *calva* the cere is often 1 or 2 mm. longer than the horny rhamphotheca and seems to be larger and more expanded. This is difficult to confirm because of variation in the amount of shrinkage in the cere of specimens.

Treron australis virescens is confined to Principe Island.

It has been a matter of some surprise that Fernando Po has a distinct race of green pigeon, while the birds of Principe, which is beyond Fernando Po and farther from the mainland, are very much like the race *calva* of West Africa. When it was possible, perhaps for the first time, to compare adequate series it became evident that the Principe popula-

tion is, as might be expected, subspecifically distinct from *calva*.

The Principe birds are darker green than *calva*, which itself is the greenest of the West African mainland races. If the two populations had contiguous continental distributions the differences might not justify a new name, but because of the anomalous distribution existing at present it seemed desirable to emphasize that the Principe birds do have some population characters. As suggested above, the size of the cere probably is also different.

Probably *poensis*, *virescens*, and *s.thomae* all represent independent colonizations from the coast, though it will be noted that in shade of color *virescens* is intermediate between the other two, as it is geographically. The São Tomé form is much more differentiated than the other two, but this may reflect greater as well as probably longer isolation.

Treron (australis) s.thomae Gmelin

This bird is obviously a member of the *australis* group but is distinct enough so that most authors have preferred to call it a species. The cere is very small and the horny part of the bill expanded and arched. In this it is approached, though not equaled, by some African races. *Treron s.thomae* also stands apart from the West African species in color. Its breast and head are dark greenish gray, the back and wings more greenish. It is a matter of opinion whether to list *s.thomae* as a race or as a representative species.

The collection contains a nest with one egg of *T. s.thomae*, perhaps the first known. The single white egg measures 32.9 by 25.4 and was fresh (January 4). The nest was 8 feet high in a cocoa tree, at an altitude of 500 meters, and was constructed of sticks, so loosely put together that the nest as received is little more than a small bundle of twigs tied together with a thong.

The usual range of wing length in the forms of *Treron* mentioned in this paper will be evident from the following figures. Males average somewhat larger than females, but the presence of numerous unsexed birds and the absence of color differences between the sexes make it best to unite the measurements.

Treron australis poensis, 160–176; *calva*, 152–166; *virescens*, 153–163; *ansorgei*, 165–180; *s.thomae*, 161–174.

Columba malherbii malherbii J. and E. Verreaux

Columba malherbii of São Tomé, Principe, and Annobon is replaced in the lowlands of West Africa by the much more vinaceous and richly colored *iriditorques*. It is now known that occasional specimens from West Africa, or at least from the Cameroons, are gray like *malherbii*, which they resemble very closely. Sharpe (1904, p. 94) long ago described such a gray bird. Through the courtesy of Mr. W. E. Clyde Todd, I have been able to examine another gray specimen of *iriditorques* from the Carnegie Museum collection. It is a male just assuming adult plumage, collected at Batanga on the Cameroon coast by Jacob Reis, Jr.

The existence of these gray mainland birds suggests that the type of *malherbii* may really have come from the Gaboon, the locality given by the Verreaux brothers. If this were the case, the name would not apply to the larger, gray birds of the islands which have been called *malherbii* for many years. The type is now in Philadelphia, and Mayr, during a recent visit to that city, compared it with the gray specimen from the Cameroons mentioned above, as well as with a specimen from São Tomé collected by Correia. He agrees with the previous opinion that the type represents the island bird. The gray Cameroon specimen, though not quite fully adult, leaves no doubt that it represents a gray phase retained throughout life and is not merely a phase of the immature plumage. As already implied, this rare gray phase of *iriditorques* differs from *malherbii* in little except smaller size. The type of *malherbii* has wing length 179, while in eight males of *iriditorques* the wing length ranges from 161 to 174. The type agrees in size with the island birds, which have wing lengths as follows: Principe, males, 170–178; São Tomé, males, 174–184.

The occurrence of occasional gray specimens of *iriditorques* in West Africa emphasizes the close relationship of this bird to *malherbii*. I believe they are no more than races and call the mainland form *Columba malherbii iriditorques*. *C. m. malherbii* in-

habits Principe and Fernando Po without variation, and the Annobon birds are also supposed to be the same race. Curiously, neither *C. m. iriditorques* nor *C. m. malherbii* is known from Fernando Po.

It may be emphasized that the few known gray specimens of *iriditorques* from the mainland agree with it in small size and cannot be considered stragglers of *malherbii*. The subadult male in the Carnegie Museum has wing 162.

Columba delegorguei, which bears a still older name, replaces *iriditorques* in east and south Africa. It has not been shown to intergrade with *iriditorques*; indeed it seems to be a bird of the uplands, while *malherbii* frequents lowland forests. It is best considered a species.

Columba arquatrix sjöstedti Reichenow

This fine pigeon, described from Mt. Cameroon, was found by Correia on Fernando Po. His series seems to differ in no way from a toptotypical Mt. Cameroon specimen sent to me by Rand. Measurements of the skins from Fernando Po: wing, males, 212–224 (217); females, 207–224 (215). Tail, males, 135–147 (142); females, 127–137 (132). The male from Mt. Cameroon measures: wing, 215; tail, 137.

Columba (arquatrix) thomensis Bocage

Correia secured several specimens of this fine pigeon, and Snow also found it not uncommon. For a colored plate, see Bannerman (1931). In the São Tomé bird the white spots, so conspicuous on the two races of *arquatrix*, are largely suppressed, except on the wing coverts. There are other color differences as well, and *thomensis* has a much longer tail. Though obviously a member of the *arquatrix* group, it is a matter of opinion whether or not *thomensis* is treated as a subspecific or as a specific representative of *arquatrix*.

The difference in proportions will be evident from the following measurements:

	WING	TAIL
<i>thomensis</i>		
♂	234	176
♀	222–238 (231)	172–186 (178)
<i>arquatrix arquatrix</i>		
6 specimens	220–235 (231)	140–153 (149)

Columba arquatrix arquatrix and *C. (a.) thomensis* are of about the same general size, as shown by wing length and by direct comparison of specimens. *S. a. sjöstedti*, though smaller, has the relatively short tail of the nominate race.

Streptopelia senegalensis senegalensis Linnaeus

SYNONYMS: *Turtur senegalensis aequatorialis* Erlanger, type locality, Ethiopia; *Stigmatopelia senegalensis sudanensis* Sclater and Praed, type locality, Upper Nile Province, Sudan; *Stigmatopelia senegalensis thome* Bannerman, type locality, São Tomé.

Peters (1931–1948, vol. 3, p. 99) did not recognize *sudanensis* and noted that *aequatorialis* is doubtfully separable from nominate *senegalensis*. Chapin (1932, p. 154) stated that *aequatorialis* is "none too sure" and that Bannerman's race from São Tomé is at best very close to *senegalensis*. With 10 specimens from São Tomé, eight from Senegal, and 20 or more from Ethiopia, plus many others from various parts of Africa, I am quite unable to find differences to support the races above synonymized with *senegalensis*. *S. s. thome* is said to be intermediate between *aequatorialis* and *senegalensis*, which is in itself enough to cause misgivings. São Tomé birds are said by Bannerman to have a paler vinous head than mainland ones, but this is not apparent in Correia's material.

Of the other races of this dove, *phoenicophila* of the oases of Morocco, Algeria, and Tunisia is slightly larger and duller than *senegalensis*, while the two Asiatic races are much browner above. I have not attempted to evaluate *aegyptica*, and have no material of *dakhlae* Meinertzhagen from Dakhla Oasis, Egypt. Wing, São Tomé, 130–143; Senegal, 134–141; Ethiopia, 131–145.

Streptopelia semitorquata semitorquata Rüppell

One from Fernando Po, male with wing 170. While a cursory examination suggested that West African birds are enough smaller to justify recognition of a race *erythrophrys*, others who have measured much more material have concluded that it is best not to do so. Accordingly the Fernando Po bird is listed under the nominate race.

Tympanistria tympanistria Temminck and Knip

Correia secured four males on Fernando

Po, the type locality of a frequently recognized race, *fraseri*, said to be found throughout Africa north of the Zambezi. Supposedly *fraseri* differs from the nominate form of South Africa by being slightly darker. Mr. C. M. N. White recently requested us to look into this matter. Chapin and I were unable to find differences to justify separation of this dove into races. The supposed color differences are virtually nonexistent. The length of the bill averages perhaps a millimeter longer in South African specimens (15–17 mm. as against 15 mm. in Fernando Po specimens), but this is not sufficient basis for a subspecies.

THE GENUS *Aplopelia*

The doves of the genus *Aplopelia* are usually assigned to two species, *larvata* of East Africa, in which both sexes are very rufous, and *simplex* of the west and central African forests, including the islands in the Gulf of Guinea. In the latter the males are grayish and the females much paler brown than those of *larvata*. White (1948) described a form *samaliyae* from Northern Rhodesia, in which the female is like that of *larvata*, but the male is more grayish and resembles the male of *jacksoni* of the eastern Congo forests. White first considered this Northern Rhodesian population to be nominate *larvata*, and indeed a pair of birds he sent us from the type locality, before the race was described, could be so classified. The female is typical of *larvata*; the male, while a shade lighter and more vinaceous than most males of *larvata*, is approached by some specimens and is identical with one Kenya skin. Presumably most males of *samaliyae* are lighter in color than the one sent to us.

Although White described the Rhodesian form as a race of *larvata*, he has since suggested in a letter to Chapin that it provides a link between *larvata* and *simplex*. He concluded that the two are conspecific. This is a reasonable suggestion, made more so by the variation described below in the populations of São Tomé and Príncipe. On Príncipe the males as well as females are brownish though less rufous than nominate *larvata* (or *bron-zina*, a small form occurring in Ethiopia). On São Tomé both brown and gray males are found.

Aplopelia larvata simplex Hartlaub

In the São Tomé Lemon Dove the plumage of typical males is gray below, washed with vinaceous on the breast, and brownish black glossed with purple on the back. Correia, however, obtained some adult males in breeding condition in which the plumage is much like that of the female of *simplex*, viz., brownish, glossed with vinaceous on the breast, becoming whitish on the abdomen and deep brown above, glossed with vinaceous on the head and shoulders. That these birds are not mis-sexed females is evident from their large size. Indeed, at first glance they appear larger than gray males and suggest that two forms of the genus inhabit São Tomé. Measurements did not bear this out, however, as is evident from the following wing lengths: males (gray phase), 145–157; males (brown phase), 152–160; females, 145–152.

Although these two types of male dress are referred to as phases in the measurements just given, it is difficult to decide whether or not intermediates occur. Some of the males are rather gray below but brown above; in others the under parts are intermediate. Unfortunately, it is difficult to know to what extent these variations are the result of immaturity or of wear and bleaching. We do, however, have an immature male of the gray phase, with brownish tips on the secondaries, in which the darker, more purplish color of the back is already evident. This disposes of the view that the hen-feathered, brown males are immatures of the gray form. The large size and fully adult appearance of one or two of them are further proof. Regardless of whether or not intermediates occur, and it seems likely that they do, the interesting fact remains that here in one and the same race gray and brown males exist. Males of the brown type are inseparable from those of *principalis* of Príncipe, while males of the gray type are inseparable from those of *jacksoni* (and presumably those of the other West African forms, including *poensis*), at least when only a few individuals are available for comparison. Females of *simplex* differ from males of the brown type only in their smaller size and somewhat duller, less glossy plumage.

This dimorphism in the male may exist

in other races as well. One of two males of *jacksoni* collected by Chapin on Ruwenzori is much more vinaceous, less grayish, than the other. A third male of *jacksoni*, collected by Grauer, is of the vinaceous type.

Great stress has been placed on differences in color of the under tail coverts in separating races of this dove. The variation found in the São Tomé series requires mention. Males of the brown phase may have the under tail coverts whitish or cinnamon buff. Gray-phase males usually have the under tail coverts gray too, but in some examples, perhaps not fully mature, they are washed with buff. In two of three females these feathers are whitish, lightly peppered with gray, in the third pale buffy. In immature females the variation is much greater. The same variation is evident in males and females of *principalis*.

The dimorphism existing in *A. l. simplex* parallels in some ways that existing in *Gallinocolumba stairi* of Samoa and Fiji (Amadon, 1943, p. 20), a not distantly related genus. In *G. stairi* it is the female sex in which both normal (hen-feathered) and cock-feathered birds occur. The sexual dimorphism is much sharper than in *A. l. simplex*, and intermediates between the two types of female plumage do not occur.

Correia obtained two nests with eggs of a "gray dove" on São Tomé. Since the nests were only 4 and 6 feet from the ground, respectively, in small "mulberry" trees in a grassy field, they doubtless represent the present species and not *Columba m. malherbii*, which, like its mainland relatives, would nest at higher levels and in the forest. Furthermore, the eggs agree in size with those of *Aplopelia simplex plumbescens* taken in the Cameroons by Bates; *malherbii* would surely lay a larger egg.

The average measurements of the four eggs of *simplex* brought back by Correia (two in each set) are 26.4 by 20.9 mm. The nests are very flimsy structures of tendrils and stems.

Aplopelia larvata principalis Hartlaub

Snow (1950) found this a common bird. Correia obtained five specimens, and we have five more taken by Mocquerys. In this dove the adult male is less gray below and

browner, less purplish, above than males of most of the related forms. At the same time it is not so brownish as the ordinary female plumage. Thus an intermediate type of male plumage has become established. This led Bannerman to regard *principalis* as a species, but the situation is merely another example of the varying degrees of sexual dimorphism existing in the genus.

OTHER FORMS: Correia did not obtain *poensis* of Fernando Po which is lacking in our collection, as are *hypoleuca* of Annobon Island and *inornata* of Mt. Cameroon. Several forms of this dove have been described from the forests of Upper and Lower Guinea, but it is a rare bird in these lowland forests, and there are too few specimens in collections to permit adequate comparisons. On the other hand, the races *larvata* of South and East Africa and *bronzina* of Abyssinia are common enough, as are the forms of São Tomé and Príncipe. The race *poensis* may not be separable from the birds of the opposite mainland. It is significant that Serle (1950, p. 355) could not separate a female from Kupe, British Cameroons, from São Tomé specimens. If the birds of the mainland are as variable as those of São Tomé and Príncipe (and the few specimens examined, as well as other evidence, indicate that they are), then the number of forms described from West Africa is far too great. Bannerman's early review of this species suffered from the same want of material that has hindered later studies.

PSITTACIDAE

PARROTS

Psittacus erithacus erithacus Linnaeus

SYNONYM: *Psittacus princeps* Alexander; Príncipe Island.

Linnaeus designated "Guinea" as the type locality of the Gray Parrot. Peters (1931-1948, vol. 3, p. 229) stated that this was an "error," which, of course, it was not, and suggested the Gold Coast as *terra typica*. Since this is a part of "Guinea," the restriction is acceptable.

Although the gray parrots of Príncipe and Fernando Po average slightly larger perhaps than those of the immediately adjoining mainland of Africa, they are, as Bannerman

has noted, exceeded by birds from the eastern Belgian Congo and the adjacent parts of Uganda and Kenya. In other words, there is, on the mainland, a cline of gradually increasing size from the western to the eastern parts of the species range. Those from French Guinea to the western parts of the Ivory Coast are set apart not only by small size but also by dark body plumage and by the dull red tail. This population, bearing the name *timneh*, is the only good subspecies of *Psittacus erithacus*.

In the nominate race, aside from the slight size variation mentioned, uniformity prevails. I am unable to see that the birds of São Tomé and Príncipe are darker than mainland ones, when allowance is made for the condition of the plumage. The light gray bloom of the plumage of this parrot is easily lost by wear, either in the wild or during the skinning process. Island birds in fresh plumage are well matched in color by specimens from southern Nigeria and elsewhere on the mainland (we have none from the Gold Coast).

Although males of this parrot average larger than females, the difference is not great. Inclusive wing measurements from selected localities are:

Sierra Leone and Liberia (= *timneh*), 207–222; Nigeria to Gaboon, 230–250; Belgian Congo, Kenya, Uganda, 235–264; Príncipe, 227–253; Fernando Po, 232–242.

Agapornis pullaria pullaria Linnaeus

Specimens of this parrot from São Tomé seem to average very slightly paler above and below than ones from the mainland of West Africa, but this may be due to the condition of the plumage. Several specimens of the island population have a few yellow feathers on the mantle. This was not observed in any examples of this race from the mainland, but one of a series of *ugandae* is so marked.

Correia did not obtain this parrot on Príncipe, where it is believed to be extirpated, nor on Fernando Po, where no one seems to have recorded it since the time of Fraser.

CUCULIDAE

CUCKOOS

Cuculus solitarius magnirostris, new subspecies

TYPE: A.M.N.H. No. 297337; adult male; Fernando Po; August 21, 1929; J. G. Correia, collector. Wing, 177; tail, 168; bill from center of nostril, 30.

DIAGNOSIS: Like *C. s. solitarius* of the mainland of Africa (type locality, eastern Cape Province) but bill longer and heavier.

BILL, FROM CENTER OF NOSTRIL

Fernando Po	
Adult ♂	19, 19.5, 20 (type)
Subadult ♂	17.5, 18.5
Gaboon	
♂	16.5, 17, 17, 17, 17.5, 18.5
♀	16.5, 17, 17.5
Belgian Congo	
20 ♂	15.5–18 (4 with bill 18)
6 ♀	16–17.5
Angola, ♂	17, 17
Abyssinia, ♂	15.5, 16, 17
Kenya	
♂	15.5, 15.5, 16.5, 17
♀	15.5, 17
Uganda	
8 ♂	15.5–17.5
♀	16, 16
Natal, ?sex	17
"South Africa," ?sex	17, 17

Apparently the only previous record of *Cuculus solitarius* from Fernando Po was a very early one by Fraser. Although the race here described is not very striking, it seemed worth naming for several reasons. This cuckoo ranges over most of Africa without appreciable variation, but it became different under the moderate degree of isolation provided by Fernando Po. It differs in having a long bill, a common trait of insular populations. Specimens from West Africa (Belgian Congo, Gaboon) have slightly longer bills than those from South and East Africa. It would seem that there is a tendency towards development of a longer bill in the tropical forest representatives of this cuckoo and that this trend has reached fuller expression on Fernando Po because the isolation of that island prevents dilution by back-crossing with shorter-billed birds in adjacent regions.

Friedmann (1930, p. 261) believed that Ethiopian examples of this species are darker

than others, but I can observe no such tendency in four specimens from that country. As is well known, this cuckoo may take several years to attain complete maturity. Of the five specimens of the new race *magnirotis*, all are males and only one, the type, seems to be fully mature, with clear gray throat and a light gray bloom on the back. The gonads were enlarged in this bird, while in the two others listed above as adult (July, October) they were small. These two birds are blacker above than the type and have the rufous and gray of the chest and throat not clearly separated. They are perhaps not quite fully adult. The remaining two birds are molting into adult, or nearly adult, plumage, but one of them has a few old, brown, and apparently immature secondaries still unmolted, while the other has several traces of the immature plumage. Though the bill is not quite so long in these subadult birds as in the type, it is definitely longer than in the great majority of mainland adults.

The type of *Cuculus solitarius magnirotis* is figured in plate 2 beside an example of *C. s. solitarius* from Natal, near the type locality of the nominate race. The somewhat unusual appearance of the bill of the type specimen is due to the fact that it was not properly closed at the time the specimen was dried.

Clamator jacobinus pica Hemprich and Ehrenberg

Correia took one specimen on São Tomé on December 12; it was molting from immature to adult plumage. This is the first and only record from any of the islands. Whether it was a straggler or whether this cuckoo has become established on São Tomé is impossible to say. It is more probable that this savanna bird reached São Tomé directly from Angola rather than from the north via heavily forested Fernando Po and Príncipe. The specimen does not seem to belong to the South African race *serratus*, which is migratory and hence would be most apt to occur on São Tomé. The race *pica* may itself not be separable from nominate *jacobinus* of India, but it proved impossible to study this question in detail.

Chrysococcyx caprius Boddaert

Hartert believed that a smaller race, *chryso-*

chlorus, of the Didric Cuckoo lives in north-western Africa. Birds from Sierra Leone often have the wing less than 112, always apparently less than 115. Those from Fernando Po measure a little larger, the wing in two of them reaching 116. Specimens from the mainland of West Africa, south to and including Angola, and from Uganda, are a bit larger but do not exceed 117 or 118 in wing length. In the Transvaal wing lengths of 120 or more are not unusual and the same is probably true in Cape Colony, the type locality of this cuckoo. This slight clinal variation is hardly worth recognizing in the nomenclature.

Chrysococcyx klaasi klaasi Stephens

This species, like *C. caprius*, is found on Fernando Po but not on the other islands in the Gulf of Guinea. Birds from the island differ in no way from ones from various parts of Africa.

Chrysococcyx cupreus insularum
Moreau and Chapin

The Emerald Cuckoo is found on all three of the Gulf islands. Moreau and Chapin (1951) have revised this species and have described as new a race inhabiting São Tomé and Príncipe. The Fernando Po population is intermediate between this new insular race and that of the adjacent parts of the mainland but nearer the latter.

STRIGIDAE

OWLS

Bubo poensis poensis Fraser

There is one adult female in the Correia Collection, with small gonads, collected July 18 on Fernando Po. It agrees in size with two females of *poensis* from the mainland (Cameroons, Belgian Congo) but is somewhat more rufous. This may well be individual variation, as six males from the mainland show considerable variation in this respect.

Otus scops hartlaubi Giebel

SYNONYM: *Athene leucopsis* Hartlaub (not *Athene leucopsis* Gould).

Correia secured one specimen, a male, of this little-known São Tomé owl; it measures, wing, 131; tail, 69.

Hartlaubi obviously belongs with the *Otus scops* group, though Peters (1931-1948, vol. 4, p. 109) placed it as a full species next to the unrelated *O. leucotis*, and Delacour (1941) did not mention it in his revision of the *Otus scops* assemblage.

In *hartlaubi* the back of the tarsus is unfeathered, and judging from our specimen the lower part of the tarsus is also bare. It will be recalled that in *Otus scops modestus* of the Andaman Islands and in some of the other Oriental races a similar reduction of the tarsal feathering occurs. *Hartlaubi* is a more heavily pigmented, rufous brownish bird than the races of the African mainland. Just how it differs from *Otus scops feae* of Annabon Island I do not know, but the tarsal feathering of that form is apparently unmodified.

Otus hartlaubi was described in detail by Sharpe (1875, pp. 311-312), and this description was quoted in large part by Bannerman (1930-1951, vol. 3, pp. 21-22). The latter followed Sharpe in using the name *leucopsis* Hartlaub for this owl, but Giebel found that this was preoccupied and substituted *hartlaubi*.

Our specimen of *Otus scops hartlaubi* is figured in plate 4 beside a specimen of *O. s. graueri*. The close general resemblance of the two will be apparent, and the reduction in feathering on the toes of *hartlaubi* is also visible.

Tyto alba thomensis Hartlaub

Correia secured a specimen of this very distinct São Tomé form on June 29—a female with large gonads. We have three others taken by Mocquerys in 1901. This race resembles *Tyto alba detorta* of the Cape Verde Islands, but is smaller (wing 255 as against 280-300 in *detorta*) and has the under parts even more rufous and the back darker, almost blackish.

Tyto alba ?poensis Fraser

Fraser described a barn owl from Fernando Po in 1848, but the species was not taken there again until Correia secured two females (gonads small) on May 12 and 15, 1929. These specimens, identical in appearance, are buffy below, the buff extending even to the under tail coverts, which are usually whitish

in *affinis*, the mainland race. In addition, the ventral spots and dorsal shaft streaks are finer and smaller than in most examples of *affinis*, and the gray and white vermiculations on the back seem more distinct and more contrasting than in most specimens of *affinis*. These differences, in part mentioned by Chapin (1932, p. 402), suggest that *poensis* may be a valid race. Chapin believes that buffy examples of *affinis* are young birds. It remains to be seen whether or not this is true of *poensis*, but the two specimens seem to be adults. They have wing length 292 and 294, near the average for *affinis*.

APODIDAE

SWIFTS

Apus affinis bannermani Hartert

This race is larger than *abyssinicus* of Africa, and the crown is more blackish and contrasts less with the back than in that form. Previously known from São Tomé and Príncipe, Chapin in 1915 picked up a dead specimen beneath a nesting colony of these swifts at Santa Isabel, Fernando Po, that definitely represents *bannermani* (wing 140+).

This would seem to be one of the few, if not the only, species of birds in which a race is common to all three of the Gulf islands and is replaced by another on the mainland. Chapin has suggested to me that this may be more apparent than real, and that specimens from the adjacent coasts might possess the characters of *bannermani*. We lack specimens to investigate this possibility adequately, but the little material available suggests that this supposition may be correct. There is much individual variation, however, and one specimen from so distant a point as north Mozambique fits in well with *bannermani*. Another possibility is that all the birds of Fernando Po are not so typical of *bannermani* as is the one examined. Were the birds of this island to prove intermediate, the situation would be similar to that described by Moreau and Chapin in *Chrysococcyx cupreus*.

Chaetura (sabini) thomensis Hartert

This swift seems to be no more than a well-marked insular race of *sabini*. Other close relatives are *mystacalis* of India, *leucopygialis* of Malaysia, and perhaps even *Chaetura (Zoonavena) grandidieri* of Madagascar.

***Chaetura sabini ogowensis* Neumann**

Correia did not obtain this swift on Fernando Po, but we have three that were taken there by Alexander, and 30 of the same race from the mainland. The largest of these 33 specimens has a wing length of 127; most of them have wing not above 122. If specimens from Sierra Leone, the type locality of nominate *sabini*, have an average wing length of 132, the smaller race *ogowensis* from Lower Guinea is probably valid. Unfortunately, Neumann did not indicate how many birds he had from Sierra Leone (perhaps only one). Nor did Bannerman give any measurements to support his statement that *ogowensis* is probably not tenable.

***Chaetura cassini* Sclater**

Correia obtained a female of this fine swift on Fernando Po on July 30. This is apparently the first record. Although this stubby-tailed, long-winged swift, like its smaller counterpart *C. böhmi*, has proportions very different from those of many chaeturas, I believe it better to leave all the spine-tailed swifts in the genus *Chaetura* until someone studies the entire group. Color pattern often suggests one arrangement, proportions another.

CORACIIDAE**ROLLERS*****Eurystomus gularis neglectus* Neumann**

The Blue-throated Rollers of Fernando Po belong, as Stresemann (1948) surmised, to the Lower Guinea form *neglectus*. Correia obtained several specimens, some in breeding condition (August), and one (January 16) in the immature plumage with blue abdomen. They appear quite the same as the type and other Angolan examples of *neglectus*. Both series exhibit great variation in the amount of blue on the upper tail coverts.

MEROPIDAE**BEE-EATERS*****Melittophagus mülleri mentalis* Cabanis**

As Bannerman has noted, this bee-eater seems to be more common on Fernando Po than on the mainland, perhaps because of the absence of competing species. We have no specimens of the Upper Guinea race,

mentalis, from the mainland for comparison with Correia's island birds. I assume that previous authors are correct in stating that the form *marionis*, described by Alexander from Fernando Po, is not separable from *mentalis*.

This is one of the few species in which the Fernando Po birds belong to the form of Upper Guinea. The nominate race of Lower Guinea is very different.

Van Someren described a supposed race *yalensis* from forested western Kenya Colony, but it seems to be based on fading of plumage rather than genetic variation (type and others examined). Chapin (1932, p. 310) also concluded that *yalensis* is untenable. Van Someren gave Nyarondo as the type locality of *yalensis*, but the actual locality as given on the specimen label is Lerundo. Van Someren (1920, p. 95) in another connection stated that these places are the same, but Chapin has established that Lerundo is about 25 miles northwest of Nyarondo and lies in a forested valley. This bee-eater is probably not found at Nyarondo which is outside the forest.

ALCEDINIDAE**KINGFISHERS*****Halcyon badia lopeszi* Alexander**

So far as one can judge, this bird was known previously only from the type, a female, which was presumably the basis for the colored plate by Jones in Bannerman (1930-1951, vol. 3, pl. 10). Correia secured one specimen, a male, October 31, 1929, with gonads large, wing, 93, and culmen, 40. The Fernando Po bird was said by Alexander to differ from *H. b. badia* (type locality, Gaboon) in being of smaller size and in the square shape of the wing speculum. The size of our specimen is certainly no smaller, but the greenish blue wing speculum is somewhat smaller and duller than in most examples of *badia*. It is doubtful if *lopeszi* is a valid race, but more specimens must be compared before a decision can be made on this matter.

***Halcyon malimbica dryas* Hartlaub**

Although there were early records of this kingfisher from São Tomé and Fernando Po, it has never been observed since on these

islands. Probably some mistake occurred. The normal range is Principe Island.

Bannerman thought *dryas* to be most like *forbesi* (type locality, Nigeria). The pale green breast band of *dryas* is lighter than that of *forbesi*, but is matched quite closely by that of *torquata*, of southern Senegal and adjacent areas. The latter, however, has the crown much grayer, less brown or fuscous, than in *dryas*, and is a smaller bird. The race *fortis* of northern Senegal (Senegal River), which I have not seen, is said to be like *torquata* but larger and with a longer bill. This race may be rather close to *dryas* in both size and color, but is doubtless separable by the color of the crown and probably by other characters. One might expect some form of this species on Fernando Po, but if it occurs there it must be rare, whereas on Principe it is one of the most characteristic birds.

***Alcedo leucogaster*
*Alcedo cristata***

The two closely related African kingfishers *Alcedo cristata* and *A. leucogaster* overlap geographically but tend to be separated ecologically. The former is found throughout the drier parts of the continent and occurs rarely along some of the more open rivers of the great forests. *C. leucogaster* is a bird of the forest rivers and is rare over much of its range. This is true, in particular, of the Congo race, *H. leucogaster leopoldi*, of which Chapin secured only two specimens during all his years in the Belgian Congo. Because of this wide overlap, these two kingfishers must be treated as species, though presumably they would seldom, if ever, nest together on the same rivers.

A member of this group of diminutive kingfishers is found on each of the three islands in the Gulf of Guinea: nominate *leucogaster* on Fernando Po; *nais* on Principe, and *thomensis* on São Tomé. The two last-named forms have been treated either as full species or as races of *cristata*. On geographical premises it would seem most likely that they were derived from the *leucogaster* stock on Fernando Po, not from *cristata*. Careful study of specimens supports this theory, and I think that *nais* and *thomensis* are races of *leucogaster*, not of *cristata*.

***Alcedo leucogaster leucogaster* Fraser**

Specimens of this bird secured by Correia confirm the larger size of this population, hitherto known from very scanty material. Wing lengths of Fernando Po birds are: males, 59–63; female, 62. The wing averages from 3 to 5 mm. shorter in the three mainland races: *bowdleri* (Upper Guinea), *batesi* (Middle Guinea), and *leopoldi* (Lower Guinea). There seems to be altitudinal size variation in *batesi*. Serle (1950, p. 358) collected a specimen at 6000 feet at Bamenda in the Cameroons which was as large as specimens of nominate *leucogaster* from Fernando Po. Since *leucogaster* and *batesi* do not differ in color, this presents a problem, but probably comparatively few of the mainland birds attain this large size.

***Alcedo leucogaster nais* Kaup**

This Principe bird is a little smaller than *l. leucogaster* (wing 54–59). The bill is also a bit smaller, but it is stout as is that of *l. leucogaster*. The chestnut of the sides is less intense in *nais*, and the under parts (except the throat) are more washed with rufous, although the center of the abdomen is often nearly white. Dorsally *leucogaster* and *nais* are very similar. The feathers of the crest are somewhat longer in the latter and more prominently marked with black and light blue bars than in either *leucogaster* or *batesi*. In *leopoldi*, however, the crest is fully as long, relative to its smaller size, as in *nais*, and the feathers are similarly barred.

The feathers of the crown are by no means so long in *nais* as in *cristata*, nor does one find the contrast between the color of the crown and the back that exists in the latter. The wings and back of *nais* are often suffused with black; this character, like the degree of rufous on the under parts, is variable.

***Alcedo leucogaster thomensis* Salvadori**

This form is much like *l. leucogaster* in size, slightly larger than *nais*. The wing measures from 57 to 62. The under parts of *thomensis* are more heavily pigmented than in the preceding forms and are, except for the white throat, uniformly rufous. The appearance ventrally is thus much like that of *cristata* and has led to the association of this form and *nais* with *cristata*. The back shows

the same intensity of pigment as in *nais*; it is blackish, glossed to varying extents with deep purplish blue. The dusky immature plumage is also correlated with the deeper coloration of *thomensis*. Though the under parts of *A. cristata* are as heavily pigmented as those of *thomensis*, the back of the former shows none of the blackish tendencies evident in *thomensis* and, for that matter, in the other races of *leucogaster*, particularly *leopoldi*. The crest feathers of *thomensis* average longer than in *nais*, and the narrow subterminal bars are lighter blue, though by no means of the light greenish blue of *cristata*. Again *leopoldi* provides a link, for it has the blue bars of the crest of the same shade as in *thomensis*.

It is perhaps worth while to recapitulate the reasons for considering *nais* and *thomensis* races of *leucogaster*, rather than *cristata*. *Nais* provides a perfect link between nominate *leucogaster* of Fernando Po and *thomensis*, not only geographically but in the color of the under parts, suffusion of the back with black, and length and color of the crest. Although the crest is longer and barred with lighter blue in *nais*, and particularly in *thomensis*, than in nominate *leucogaster* or *batesi*, these characters are shared by *leopoldi* of the Belgian Congo. More important perhaps as indicating relationship are the blackish upper parts of *leopoldi*, *nais*, and *thomensis*. Furthermore, since all three of the islands in the Gulf are rather heavily wooded, one would expect the forest species, *leucogaster*, rather than the savanna species, *cristata*.

BUCEROTIDAE

HORNBILLS

Ceratogymna atrata Temminck

Specimens in breeding condition were taken in September on Fernando Po.

CAPITONIDAE

BARBETS

Pogoniulus subsulphureus subsulphureus Fraser

As Chapin has noted, the fine series taken by Correia shows that this race is limited to Fernando Po. It is separable from *flavimentum* of Lower Guinea (type locality, Gaboon) by its larger bill and the duller color of the yellow markings.

Pogoniulus leucolaima poensis Alexander¹

There is some mystery about this bird. Alexander (1903, pp. 393-394) said it is common on Fernando Po, and listed eight specimens from three different localities. No one else has found it, though *P. subsulphureus* and *P. scolopaceus* are common. Bannerman (1930-1951, vol. 3, p. 394) stated that all of Alexander's material is inexplicably missing from the British Museum, so it seemed reasonable to suggest that a mistake had occurred as to the occurrence of this species on Fernando Po. I wished to check once more upon this matter and, in the absence of Dr. Bannerman in Africa, wrote to Mr. Derek Goodwin of the British Museum. He replied that Alexander's specimens are there, correctly labeled! I have not been able directly to investigate the validity of the race *poensis*.

PICIDAE

WOODPECKERS

Campethera nivosa ?poensis Alexander

Correia secured seven of these woodpeckers, and we have one of Alexander's original series. I am unable to appreciate most of the characters ascribed to *poensis* by Bannerman. The Fernando Po birds are very difficult to separate from nominate *nivosa* of Upper Guinea. The ventral spotting is perhaps a shade lighter, more whitish, and less washed with greenish. In this they are perhaps more like the race *efulensis* found near the coast from the Cameroons to Angola, but that race has the green of the under parts somewhat darker; the back is also slightly darker. Much of our material of this woodpecker is not in very good plumage; this makes it impossible to make a definite decision as to the validity of *poensis*.

INDICATORIDAE

HONEY GUIDES

Indicator exilis poensis Alexander

Correia secured three adult males, one adult female, and two immature females of this Fernando Po subspecies, evidently known hitherto only from the type. No fewer than seven races of this obscurely col-

¹ Peters considered *leucolaima* conspecific with the *bilineatus* forms of eastern Africa.

ored and infrequently collected little bird are recognized from western Africa; several are known from the type only. This does not include *Indicator propinquus* Friedmann from the Cameroons, which Chapin believes is probably based on an individual variant of *I. e. exilis*. It is possible that when adequate material is available some of these forms will prove invalid. The race *poensis* differs from *exilis* as follows: the under parts are paler gray and the throat more whitish; the crown and head are grayish, not washed with greenish olive as in *exilis*; the size is apparently slightly larger.

We have a specimen taken at Degama, southern Nigeria, by Anson, which differs from *e. exilis* (and still more from *poensis*) in the brighter yellow of its back and rump. It is also tinged with green ventrally. The size is large. It probably belongs to *hutsoni* Bannerman, from northern Nigeria, described from a single specimen.

A specimen of *angolensis* taken at Chitau, Angola, is paler below than *poensis* and differs from that race in having the crown washed with greenish. It is much like *meliphilus* Oberholser from Taveta, Kenya (type examined); indeed *angolensis* may not be separable from *meliphilus*, which was already known to reach Nyasaland.

Of the three other supposed West African races, we lack material; they are *willcocksi* Alexander (Gold Coast), *leona* Grant (Sierra Leone), and *ansorgei* Grant (Portuguese Guinea). The first two have greenish on the crown and are thus separable from *poensis*. Grant said that *ansorgei* is like *poensis* but larger, though the wing of the type, a male, exceeds by only 1 mm. that of the largest of our three males of *poensis*, while Grant's one female of *ansorgei* had the wing exactly the same length (72) as Correia's female. It is highly unlikely, of course, that Portuguese Guinea and Fernando Po have the same race, with different, greenish forms occupying the intervening areas. The wing measurements of the specimens examined by me are: *exilis*, five males, 70-76; five females, 67-72; *poensis*, males, 75, 76, 79; female, 72; *hutsoni*, one male, 80.

In summary, it seems likely that *poensis* is a valid race, restricted to Fernando Po. The plumage of this species is subject to

great wear, especially about the head. As a result, some mainland birds in which the plumage of the crown is normally washed with green may appear almost as grayish as *poensis*.

Delichon urbica urbica Linnaeus

Correia obtained three specimens of this migrant on Principe on September 28. Curiously, the House Martin was previously known in the Gulf of Guinea from this island only, nor does it seem to be a common winter visitant on the mainland this far south.

HIRUNDINIDAE

SWALLOWS

Psalidoprocne fuliginosa Shelley

I have seen no material from Cameroon Mountain, so merely follow others in regarding *poensis* Alexander from Fernando Po as a synonym of *fuliginosa*.

PYCNONOTIDAE

BULBULS

Andropadus gracilirostris gracilirostris Strickland

Fernando Po is the type locality. Birds from there agree well with West African ones, though their under wing coverts seem to be on the average yellower and less orange.

Criniger calurus calurus Cassin

Specimens from Fernando Po seem inseparable from ones from the Gaboon, the type locality. Three birds from Sierra Leone differ from *calurus calurus* in having the upper tail coverts, as well as the back, green; they are also larger. Thus they agree with the description of *verreauxi* from the Gold Coast and suggest that Bannerman (1930-1951, vol. 4, pp. 145-146) was correct in believing that *swainsoni* Neumann from Sierra Leone is based on a discolored specimen and is actually inseparable from *verreauxi*. We have, however, no other specimens of *verreauxi* for direct comparison. Two birds taken by Anson in southern Nigeria (Gregani; Oguta) agree with the nominate race in size and have some rufous on the upper tail coverts, though less than in most specimens of *calurus*, hence they are intermediate towards *verreauxi*.

Phyllastrephus icterinus tricolor Cassin

Upper Guinea birds of this species are slightly yellower below than Lower Guinea ones, so that Chapin and also Serle currently recognize a race, *tricolor*, for the latter. Serle (1950, p. 374), presumably through a slip of the pen, said that Lower Guinea birds are brighter (not duller) than Upper Guinea ones. Of the latter we have only four specimens (Sierra Leone). Others taken by Serle in southern Nigeria and examined by Chapin also exhibited the characters of *icterinus icterinus*.

OTHER BULBULS

Correia also obtained the following bulbuls on Fernando Po; comparisons indicate that current belief that none of them exhibits appreciable geographic variation on that island is correct: *Andropadus virens virens* Cassin, *Andropadus latirostris latirostris* Strickland, *Andropadus tephrolaema tephrolaema* Gray, *Calyptocichla serina* J. and E. Verreaux, and *Bleda eximia notata* Cassin.

MUSCICAPIDAE

PRIMITIVE INSECT-EATERS

MUSCICAPINAE

FLYCATCHERS

Horizorhinus dohrni Hartlaub

Though less puzzling than *Amaurocichla*, the present monotypic genus, endemic to Principe, has been considered a babbler by some, a flycatcher by others; the possibility that it is a thrush also deserves consideration. Perhaps the best guess is that it is an aberrant member of the Muscicapinae, to be placed in the vicinity of such genera as *Fraseria* and *Sigelus*. *Horizorhinus dohrni* is a common bird on Principe. Snow (1950) has described its habits, song, and nest. Two views of this species are shown in plate 4.

Fraseria ocreata ocreata Strickland

Topotypical specimens from Fernando Po seem to differ in no way from those of the mainland of Lower Guinea.

Alseonax seth-smithi van Someren

SYNONYMS: *Alseonax flavipes* Bates and *Alseonax flavitarsus* Bates.

Correia took a series of this little flycatcher

on Fernando Po—apparently the first records. The specimens do not differ from mainland ones.

Muscicapa adusta obscura Sjöstedt

Correia did not obtain it, and, though we have one Fernando Po specimen taken by Alexander, we lack sufficient comparative material. I assume that Bannerman is correct in treating the island birds, which have been named *poensis*, as belonging to the Mt. Cameroon race *obscura*, a decision that was recently confirmed by Serle (1950, p. 602).

Batis poensis Alexander

We have no specimens from the mainland to compare with a small series from Fernando Po.

Dyaphorophya castanea castanea Fraser

Fernando Po birds are somewhat larger than those of Lower Guinea, but in the eastern part of the range the size again increases slightly. Some eastern specimens, particularly those from localities of appreciable altitude, such as Mt. Elgon, may exceed Fernando Po birds in dimensions.

Dyaphorophya blissetti chalybea Reichenow

Correia obtained one specimen on Fernando Po. It is an immature, sexed as a male. The throat and upper breast are pale rufous, with a black band separating this rufous area from the white abdomen; dorsally it lacks the metallic gloss of the adult. It is thus in a plumage similar to that described by Bannerman (1930–1951, vol. 4, p. 280) for the “immature full-grown male,” but the back is dull black, not gray. Gronvold’s drawing of *chalybea* in Bannerman (*loc. cit.*) shows a bird with a white rump; there is some error; the upper parts are blackish in this species.

Megabyas flammulatus flammulatus

J. and E. Verreaux

The collection contains one adult male of this striking flycatcher from Fernando Po, apparently the first record.

Terpsiphone rufiventer tricolor Fraser

This Fernando Po subspecies is paler than *neumanni* of the adjacent mainland.

Terpsiphone atrochalybeia Thomson

The São Tomé Paradise Flycatcher is a representative of *T. viridis* of Africa and with it constitutes a superspecies. The race *T. viridis speciosa* of the Belgian Congo and adjacent areas is polymorphic, and occasional males have the back and tail black as in *atrochalybeia*, but no form of *viridis* has the plumage so generally metallic as the male of the São Tomé bird.

Correia collected two nests of this flycatcher, one empty, the other (October 24) containing two fresh eggs. Nests and eggs were also taken by Alexander. The present nests are constructed largely of strips of flat, brown, paper-like leaves, bound together with spider webs and ornamented on the outside with bits of green moss and with one bright green feather, apparently from *Agapornis pullaria*. The nests were molded to slender bamboo stems, about 10 feet above the ground. The two eggs measure 19.0 by 14.6 and 19.3 by 14.5.

TIMALIINAE**BABLERS****Malacocincla rufipennis bocagei** Salvadori

Bannerman (1930-1951, vol. 4, p. 110) found no color differences between this race, with type locality Fernando Po, and nominate *rufipennis* from the Gaboon. His material, however, indicated a difference in the size of the bill. Correia did not obtain *bocagei*, but we have two of Alexander's specimens and a series taken in the Gaboon by Ansorge. No appreciable difference in size is apparent, but the pair from Fernando Po are darker, more grayish, below and on the cheeks and crown than are the mainland specimens.

Malacocincla cleaveri poensis Bannerman

I have seen no specimens of this Fernando Po race, which was described in 1934 from specimens taken by Alexander.

Alcippe abyssinica claudei Alexander

Our only material is one of Alexander's specimens from Fernando Po. We have but one specimen of the related race *monachus* from Cameroon Mountain. The Cameroon specimen is noticeably more rufous and some-

what darker in color than the Fernando Po one.

SYLVIINAE**WARBLERS****Macrosphenus flavicans flavicans** Cassin

SYNONYMS: *Macrosphenus poensis* Alexander from Fernando Po and *Macrosphenus flavicans angolensis* Bannerman from Angola.

Correia's one specimen from Fernando Po is large (wing 63). If really a female as sexed, it suggests that the Fernando Po population of this warbler, like that of *M. concolor*, is composed of birds of larger size than their mainland representatives. More material must be measured.

Bannerman based his race *angolensis* entirely on shortness of the bill, which he said ranged from 14.5 to 15 in five Angola birds. This he states to be at least 4 mm. shorter than the bill of nominate *flavicans*. My measurements do not bear this out: Fernando Po, female, 16; Cameroons, males, 15, 15.5, 16, 16, 16.5; female 16; Angola, males, 15.5, 16, 16; female, 15.5.

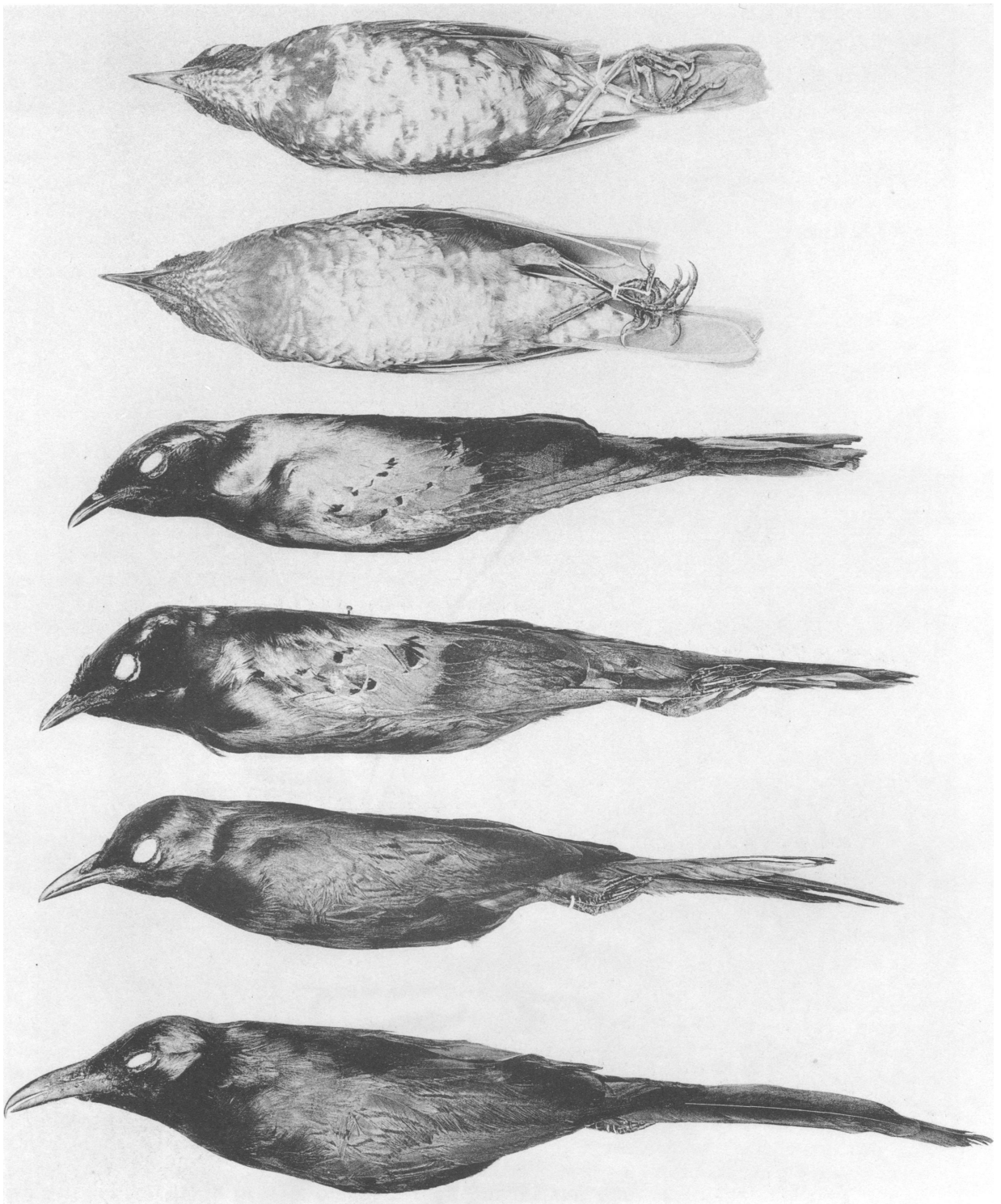
Macrosphenus concolor Hartlaub

Correia secured two males on Fernando Po. They are slightly larger than any of a considerable series from the mainland, but in the absence of color characters the difference is not worth naming, at least without more material.

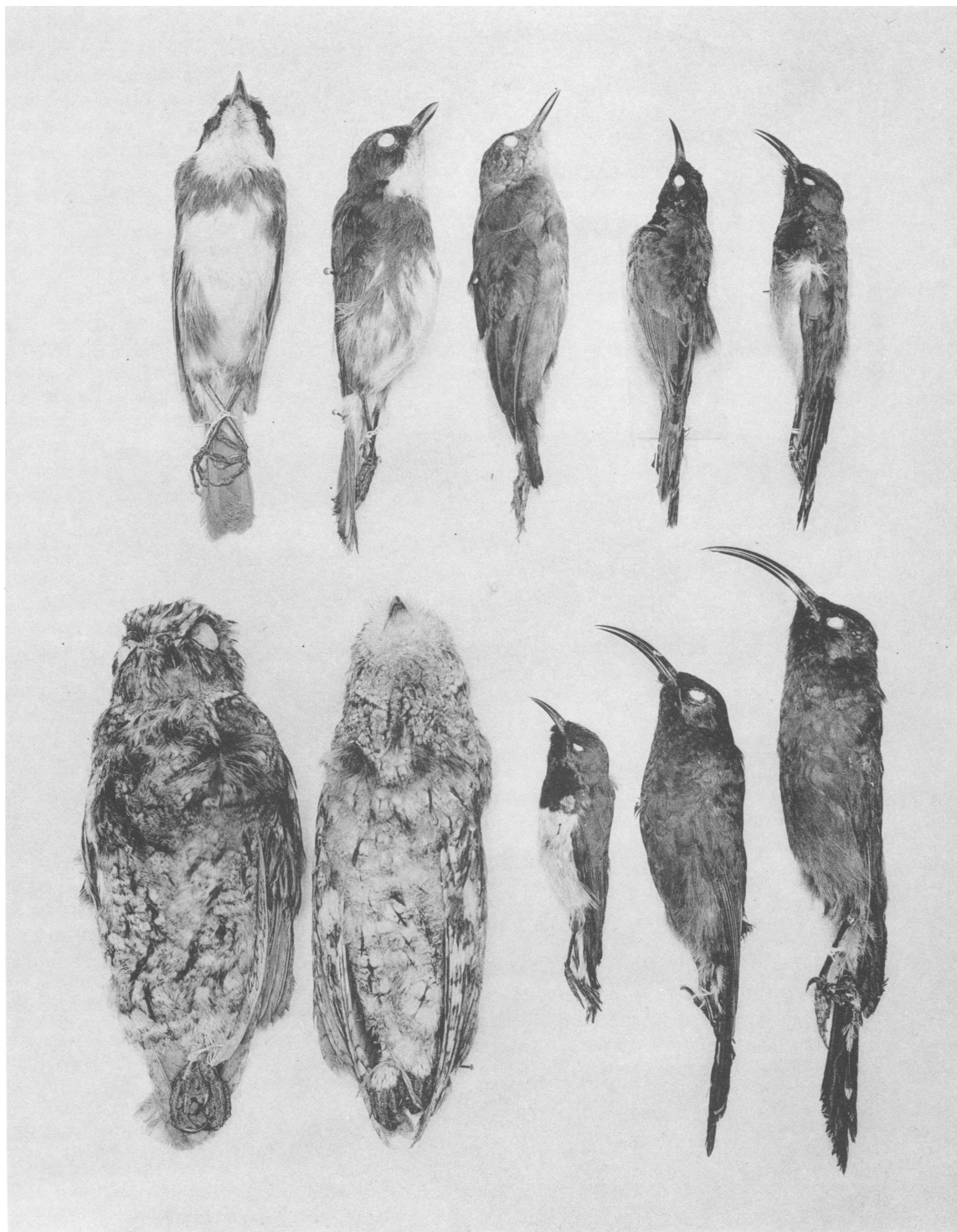
The wing length of these two birds is 62 in each; the wing of males from the mainland seldom reaches 60, if our material is any indication.

Cameroptera superciliaris superciliaris Fraser

Bannerman and others recognize half a dozen races of this warbler, but I have great difficulty in making them out. Fernando Po birds (*superciliaris*) are bright above, very yellowish around the face. They are very close, if not the same, in color as birds from Upper Guinea (*willoughbyi*), northern Angola (*pulchra*), and the forests of Uganda (*ugandae*). Those of the Lower Guinea forests are slightly paler, more grayish below; for them the name *flavigularis* is now used. *Willoughbyi*, of which we have but one specimen, a male from Sierra Leone, may be separable



Top to bottom: *Turdus olivaceofuscus xanthorhynchus*, *Turdus olivaceofuscus olivaceofuscus*, *Lamprotornis splendidus splendidus*, *Lamprotornis splendidus lessoni*, *Onychognathus fulgidus harilaubii*, *Onychognathus fulgidus fulgidus*



Top row, left to right: *Horizorhinus dohrni* (ventral and side views), *Amaurocichla bocagei*, *Cyanomitra reichenbachi*, *Cyanomitra hartlaubii*. Bottom row, left to right: *Otus scops hartlaubi*, *Otus scops graueri*, *Cyanomitra newtoni*, *Cyanomitra thomensis* (female), *Cyanomitra thomensis* (male)

from nominate *superciliaris* by smaller size or shorter bill, if not by color. Of *pulchra* I examined two specimens, both males, one the type, and of *ugandae* four specimens, not in the best of condition. The above remarks, therefore, are tentative, but it may eventually be found that the slight geographical variation existing in this species does not lend itself to the useful application of subspecific names.

Cameroptera chloronota granti Alexander

Bannerman thought this Fernando Po form inseparable from nominate *chloronota* (Togoland to Cameroons), but Chapin and I independently decided that Correia's birds are grayer below and longer billed than *c. chloronota*. The exposed culmen measures 14 to 15 in *granti*; 13 or less in *chloronota*.

Eremomela badiceps badiceps Fraser

A very fine series of this warbler from Fernando Po averages slightly paler in color, particularly in the chestnut of the crown, than a series from the Cameroons and Gaboon. The island birds are slightly larger. These differences are not of racial importance, especially since specimens from Angola are again more like the Fernando Po ones in size and also apparently in color.

Apalis rufogularis rufogularis Fraser

Correia secured four specimens on Fernando Po. We have also a female and an immature taken by Alexander. Examination suggests that adequate material from the opposite mainland may prove that the race *rufogularis* should be restricted to Fernando Po.

Amaurocichla bocagei Sharpe

Correia secured three skins of this endemic São Tomé genus and species. It was known hitherto from the type in London and from two or three specimens in Lisbon. This bird has usually been placed in the Timaliinae, but Delacour (1947, p. 12) regards it as an aberrant member of the Sylviinae.

Sharpe said that *Amaurocichla* differs from *Crateroscelis* in having the tenth (outermost) primary almost as long as the ninth. Such a wing formula would be perhaps unique in the Oscines. Actually, *Amaurocichla* has a nine-

primaried wing. It is the long ninth primary (not the tenth) that forms the outer border of the wing. Most timaliids and sylviids have rather short, rounded wings, with a long tenth primary. *Amaurocichla* seems to be a long-legged, weak-flying denizen of the undergrowth, and it is inexplicable why the tenth primary should be vestigial. A tendency in this direction is found in certain migratory northern sylviids, such as *Sylvia nisoria* and *Hippolais*, in which the wing has become relatively long and pointed and the tenth primary much reduced. It is conceivable that *Amaurocichla* is the descendant of some such migrant which became stranded on São Tomé, presumably during a period of changing climates (e.g., the glacial periods) when such colonizations were more apt to occur. If the tenth primary was already much reduced, its complete functional disappearance would be less startling.

Another possibility is that *Amaurocichla* is unrelated to the warblers or babblers but belongs rather to some family in which the nine-primaried condition is normal. Of such one finds in Africa only the Zosteropidae, Motacillidae, and Fringillidae. *Amaurocichla* is not allied to these. Its general appearance and the reduction of the rectrices to 10 (noticed by Bannerman) suggest certain sylviids, as does the tendency of the rectrices to lose the vanes terminally and end in exposed, slightly stiffened shafts (see pl. 4). I think it best to follow Delacour's treatment of *Amaurocichla* as an aberrant sylviid.

TURDINAE

THRUSHES

Stizorhina fraseri fraseri Strickland

The nominate form has been considered to inhabit West Africa as well as Fernando Po, which is the type locality. Correia's ample material shows that Fernando Po birds are paler, less rufous below, particularly on the under tail coverts, than mainland ones; the rump is paler chestnut. The name *rubicunda* Hartlaub, with type locality Gaboon, is available for the mainland form.

The race *vulpina* of the eastern Belgian Congo has, on the average, more chestnut in the tail than *rubicunda* or *fraseri*. Birds from Uganda are a bit larger than Belgian

Congo examples of *vulpina*, but not sufficiently so to validate the race *intermedia*.

***Alethe poliocephala poliocephala* Bonaparte**

Correia did not obtain this species, but we have one male from Fernando Po from the Alexander collection. It has a longer bill (17) than any of a trayful of birds from the mainland, though it is approached closely by one specimen. The Fernando Po skin is more richly colored above, particularly on the rump. It is quite possible that after comparison of more Fernando Po material it will be found that the nominate race of this alethe should be restricted to Fernando Po, and the name *alexanderi* Sharpe, with type locality Efulen, Cameroons, used for the Lower Guinea population. When naming this form Sharpe had not seen Fernando Po specimens.

***Alethe castanea castanea* Cassin**

Fernando Po birds agree well with those of comparable age from the Gaboon and Cameroons. In older skins foxing causes the back to appear redder.

***Turdus olivaceofuscus xanthorhynchus* Salvadori**

Correia collected four specimens of this rare bird. It differs from the nominate race, which is common on São Tomé, in its bright yellow bill and tarsi, larger, more blackish ventral markings, smaller size, and smaller bill (see pl. 3).

According to Chapin, *olivaceofuscus* seems to be an insular representative of the widespread group of African thrushes for which *olivaceus* is the oldest name. He includes *nigrilorum* of Cameroon Mountain (and the related *poensis* of Fernando Po) in the species *olivaceus*, inasmuch as specimens collected at intermediate altitudes in the Cameroons show intergradation with the lowland birds. *Turdus libonyanus*, sometimes included in this group, is, Chapin tells me, a separate species, partial to the dry country of southern Africa; it may be allied to *tephronotus* of East Africa. *T. abyssinicus* of the highlands of East Africa is yet another species.

LANIIDAE

SHRIKES

***Lanius newtoni* Bocage**

A shrike should not be a difficult bird to

record, yet Alexander, Fea, and, more recently, Snow all failed to report this endemic São Tomé species. Correia found it not uncommon. Although clearly a representative of *Lanius collaris*, *L. newtoni* is best kept as a species to form with *collaris* a superspecies. There are rather pronounced differences in color, and the bill of *newtoni* is smaller. The legs of the latter are grayish brown, not black as in *collaris*, and the tarsi of the island bird are thinner and weaker. All in all, *newtoni* is a less robust bird than *collaris*. We do not know whether or not this is reflected in its feeding habits.

Unlike *collaris*, the female of *newtoni* has no rufous on the flanks and is inseparable from the male in color. The immature plumage of *newtoni* is much darker on the back than is that of *collaris*, and apparently less barred.

NECTARINIIDAE

SUNBIRDS

Delacour's (1944) revision of the sunbirds establishes the main lines of relationship in this family. I feel, however, that in such a closely knit group it is well to treat as genera some of the natural groups reduced to subgenera in Delacour's paper. Thereby, the genus *Nectarinia* does not assume such unwieldy proportions.

Anthreptes rectirostris tephrolaema

Jardine and Fraser

SYNONYMS: *Anthreptes tephrolaema elgonensis* van Someren.

This is another species in which Fernando Po birds are slightly larger than those of the West African lowlands, but matched by those of the eastern part of the range (Kenya, etc.). This will be evident from the following wing measurements:

Fernando Po	
♂	60-64
♀	58, 58
West Africa	
♂	52-58
♀	50-57
Kenya	
♂	57-61
♀	57-62

Since there is no variation in color, it is

best to unite all these birds, including *elgonensis*, in the race *tephrolaema*.

***Anthreptes collaris hypodilus* Jardine**

The West African populations of this sunbird were long considered to fall into two races, *subcollaris* of Upper Guinea and *hypodilus* of Lower Guinea (including Fernando Po, the type locality). Recently Chapin (1949, p. 83), basing his conclusions on some 42 specimens from Fernando Po taken by Alexander, Correia, and others and 80 specimens from the Lower Guinea mainland, showed that the latter are consistently smaller. He named the mainland population *somereni*, as van Someren had previously called attention to this size difference. Chapin noticed that specimens from the forests of the eastern Belgian Congo average somewhat larger than those of West Africa (49–55 as against 48–52 in the Cameroons and Gaboon), but are, nevertheless, perceptibly smaller than Fernando Po material (wing 52–59). These slightly larger birds from the eastern Congo are, in fact, intergrades towards the race *ugandae*, which, like *hypodilus*, is large. It differs from *hypodilus* in having the abdomen brighter yellow, much like that of *subcollaris*.

White in his recent revision of this species (1950, p. 42), made *somereni* a synonym of *hypodilus*, ostensibly because of the slight increase in size in the eastern Congo. However, he underestimated the size of topotypical *hypodilus* and wrote: "Wing in six males from Fernando Po 54–56, one 59 mm." With only half a dozen specimens it was, of course, quite unjustifiable to suggest that the specimen with wing 59 lies outside the usual range of variation.¹ Furthermore, he had Chapin's published statement that the American Museum series ranges up to 59 in wing length. Three males in our series have the wing that long, and in several others the wing measures 57 or 58. In a word, *somereni* is a satisfactory subspecies, more especially since Chapin with his excellent material pointed out also a slight difference

¹ Simpson (1941, p. 792) has calculated that even in a sample twice the size of that measured by White (viz., 12) the range of variation, on the average, will be only one-half of that normally to be expected in a sample of 1000.

in the color of the flanks in *hypodilus* and *somereni*.

White, in the revision mentioned, named a race, *A. c. nigeriae*, from the area of intermediacy between *subcollaris* and *somereni*. Examination of 24 skins from southern Nigeria in the Rothschild Collection makes it seem doubtful whether this intermediate population is stable enough or extensive enough to warrant being named. Most of these 24 specimens agree rather well with *subcollaris*.

***Anthreptes seimundi seimundi* Ogilvie-Grant**

Restricted to Fernando Po and separated from *minor* of West Africa by its larger size.

***Cyanomitra batesi* subsp.**

The collection contains one male of this obscurely colored little sunbird, the first record for Fernando Po. The specimen is visibly larger than birds from the mainland. Just as in *Anthreptes fraseri* and *Cyanomitra seimundi*, there is probably a race of large size on Fernando Po, but in the absence of any color difference it can scarcely be described from a single specimen.

	WING	CULMEN
Fernando Po, ♂	54	16
Mainland		
6 ♂	46–52	14–15
2 ♀	45, 48	13, 14

Chapin's notes mention a mainland male in the Academy of Natural Sciences of Philadelphia with wing 53.5 and culmen 14. This bird is almost as large as the Fernando Po specimen, at least in length of wing.

***Cyanomitra cyanolaema cyanolaema* Jardine**

Hitherto thought to inhabit the forests of Lower Guinea, as well as Fernando Po, the nominate race is actually restricted to Fernando Po. The diagnosis of the following form lists the differences between it and the mainland birds.

***Cyanomitra cyanolaema octaviae*, new subspecies**

TYPE: A.M.N.H. No. 690129; adult female; May 21, 1903; Efulen, Cameroons; G. L. Bates, collector; field number 160; wing, 65; tail, 47; exposed culmen, 20.

DIAGNOSIS: Like *C. c. cyanolaema* of Fernando Po but females more yellowish and

less greenish on the back, wing coverts, lower abdomen, and under tail coverts. The feathers along the edge of the wing are virtually white in *cyanolaema*, yellowish in *octaviae*. General size, as reflected by wing length, less in the mainland birds, except in those from near the southern (Angola) and eastern (Uganda) edges of the range. These, as a result of clines of increasing size, average as large as the nominate race.

Bill length in this species varies independently of general size. It is about the same in *cyanolaema* and *octaviae*; in *magnirostrata* of Upper Guinea (type locality, Sierra Leone), the bill is very long, though the race agrees in general size with the smaller birds of the Lower Guinea forests.

RANGE: Forests of Lower Guinea from southern Nigeria south to northern Angola and east to the forested parts of Uganda. Presumably intergrading with *magnirostrata* somewhere to the west of Nigeria, perhaps in the Gold Coast colony.

Measurements of the three races of *Cyanomitra cyanolaema* follow:

	WING
<i>octaviae</i>	
Southern Nigeria, Gaboon, Cameroons	
8 ♂	63-68 (67)
6 ♀	62-65 (64)
Belgian Congo	
12 ♂	67-71 (68)
5 ♀	64-66 (66)
Angola	
3 ♂	70, 72, 73
1 ♀	69
Uganda	
3 ♂	70, 72, 72
1 ♀	65
<i>cyanolaema</i>	
Fernando Po	
8 ♂	68-75 (72)
3 ♀	65, 66, 68
<i>magnirostrata</i>	
Liberia	
1 ♂	65
	CULMEN
<i>octaviae</i>	
23 ♂	20-24 (21.3)
13 ♀	19-22 (20.7)
<i>cyanolaema</i>	
7 ♂	20.5-23 (21.6)
3 ♀	21, 21, 22
<i>magnirostrata</i>	
1 ♂	25

Our only specimen of *magnirostrata*, an adult male from Liberia, is approached in culmen length by one male, probably an unusually large individual, from northern Angola (25 versus 24 mm.). In the Angola specimen the long bill is associated with large general size (wing 71 versus 65 mm. in the specimen of *magnirostrata*). Furthermore, as Bannerman and others have pointed out, the bill seems to be somewhat less curved in *magnirostrata* than in the other races, and the coloration may be a bit darker.

Cyanomitra olivacea obscura Jardine

This race inhabits Fernando Po and Principe. On the latter it is rare, and Correia did not obtain it, but we have three taken by Mocquerys in 1901. They seem not to differ from a good series from Fernando Po.

Obscura itself is barely separable from *cephaelis* of the lowlands of Lower Guinea, but perhaps averages a little larger and longer billed. The abdomen may be a shade paler. The race *ragazzii* of Abyssinia, to which some have assigned West African birds, seems to be somewhat darker green than *cephaelis*.

Cyanomitra hartlaubi Verreaux

Cyanomitra hartlaubi of Principe is one of a group of four species, all closely related, which share among other characters a somewhat graduated tail with white markings. This group might be recognized as a subgenus, *Anabathmis*, of *Cyanomitra*. The species of this group are: *reichenbachii* (West Africa); *hartlaubi* (Principe Island); *newtoni* and *thomensis* (both endemic to São Tomé). Curiously no member of the subgenus has been found on Fernando Po. The four species are shown in plate 4.

Cyanomitra hartlaubii itself is intermediate between *reichenbachii* and *newtoni*. In *reichenbachii* the throat, sides of the face, and crown are metallic blue; in *hartlaubii* the blue is restricted to the throat and is present only in the adult male. The under parts are grayish in *reichenbachii*, yellowish in *hartlaubii*.

Cyanomitra newtoni Bocage

This species resembles *hartlaubii* but is much smaller. The breast of the male, below the metallic throat, is bright yellow, not dull yellowish brown as in *hartlaubii*. There are

also other minor differences in color.

Newton long ago obtained a nest and two eggs of *newtoni*. Correia obtained four nests with eggs (October 24–February 3). Two held two eggs and two one egg, but perhaps the latter two sets were incomplete. The range of measurements of five eggs is 15.1–17.2 by 11.4–12.2. The nests contain moss, chicken feathers, cotton, and fine grass, and were placed from 5 to 8 feet from the ground. They were suspended from the limbs of small trees: one a lime tree, another a tree in a coffee plantation, and yet another a thorn bush.

Cyanomitra thomensis Bocage

In this species not only the size but the color is much modified from that found in the three other species. The entire upper parts, and the under parts with the exception of the dull yellowish lower abdomen and under tail coverts, have become blackish. The black feathers are glossed with metallic blue, but to a lesser extent than the metallic blue throat of the related species. In *reichenbachii* the sexes are again alike in color. Presumably *thomensis* represents an earlier colonization of São Tomé by *Anabathmis* stock. The later arrival of what is now *newtoni* may have led initially to competition for food so that the smallest and largest of the four species, as well as the two most dissimilar in color, are *thomensis* and *newtoni*. This and other aspects of the evolution of *Cyanomitra thomensis* are discussed below.

The species *thomensis* is the largest of the numerous sunbirds of Africa and is exceeded in size in the family Nectariniidae only by one or two species of the aberrant Oriental genus *Arachnothera*. Many have followed Reichenow in placing *thomensis* in a monotypic genus *Dreptes*. There can be no very strenuous opposition to such a course, but I prefer to keep it in a subgenus (or genus) *Anabathmis*, to make clear that it is only a highly differentiated relative of the species *reichenbachii*, *harilaubi*, and *newtoni*.

Correia found a nest of *thomensis* with one heavily incubated egg on January 3, and a nest with two fresh eggs on January 21. The latter measure 21.1 by 14.9 and 21.8 by 15.0. Like those of *newtoni* they have a whitish ground color and are heavily marked,

particularly at the larger end, with small spots. The color of the markings is browner, less grayish, in *thomensis* than in *newtoni*. These nests and eggs are the first known. One of the nests was 40 feet up in a forest tree; the other was placed at an undetermined height in a bamboo.

The nests are of the pensive type usual in sunbirds. They are built of green moss, rootlets, and skeletonized remains of leaves. There is a thick lining on the bottom and extending up the sides of the interior cavity; it contains none of the green moss so conspicuous in the body of the nest, and comprises a separate part of the nest. The lining is of dried, brown, fine grass and the veiny structure of dried skeletonized leaves. The nests measure about 25 to 30 cm. in length.

Chalcomitra rubescens stangerii Jardine

Bannerman (1930–1951, vol. 7, p. 197), in a footnote to his account of this species, wrote: "I am indebted to Captain C. H. B. Grant for pointing out that striking differences exist between the island [Fernando Po] and mainland females of this Sunbird." Correia's material shows that females from Fernando Po Island have the breast more heavily streaked and the color of the streaks darker, more blackish, than in females of the nominate mainland race. In addition, the throat of the island birds is usually darker, almost sooty, but the possibility that one is dealing with mis-sexed immature males makes it unwise to place too much emphasis on specimens showing this difference. There is no geographical variation in the amount of yellow suffusion on the under parts. In two island specimens taken by Alexander and now in the American Museum no yellow is present, but this is because they were in very worn plumage. Because of the pronounced difference in the streaking on the throat, it seems reasonable to separate the Fernando Po population of this sunbird racially, even though the males are inseparable.

The name *stangerii* Jardine (1842, p. 187) is here used for the Fernando Po race. The original description does not give a definite locality and rather implies that the specimen described came from the Niger. But Shelley, who was a careful worker, wrote as

follows in his monograph of the sunbirds (1876-1880, p. 280): "It inhabits West Africa from Cameroons to Angola, and has been met with on Fernando Po, where it was shot by Dr. Thomson during the Niger expedition, and was named by Sir W. Jardine after Dr. Strange [Stanger], the geologist to the expedition. . . ."

In the absence of evidence to the contrary, I am assuming that Shelley was correct in this matter. Apparently *Chalcomitra rubescens* has never been recorded from Nigeria and is unknown north of the Mt. Cameroon area (and Fernando Po). This is, of course, an additional weighty reason to believe that the type of *stangerii* did come from Fernando Po rather than from along the Niger. Captain Grant and Mr. Derek Goodwin kindly advised me that the type of *stangerii* does not seem to be in the British Museum. If it does exist elsewhere, it might, of course, settle the question finally. The Fernando Po birds do not differ appreciably from mainland ones in size.

Nectarinia minulla Reichenow

Correia secured two males and an immature female on Fernando Po, the first records for the island. This species is best separated from *N. chloropygia insularis* by its shorter, straighter bill (in some regions the color of the under wing coverts is diagnostic, but this is *not* true on Fernando Po). The three specimens of *minulla* from Fernando Po average slightly larger than the ones from the mainland. In color they appear to be identical, though it is possible, of course, that comparison of adequate series, particularly of females, would reveal minor distinctions.

The wing measurements are:

Fernando Po	
♂	50, 51
♀	48
West Africa	
10 ♂	46-47
♀	44, 46
Eastern Belgian Congo	
5 ♂	47-50
♀	45

The bills of the Fernando Po specimens are no longer than those of the mainland birds.

Nectarinia chloropygia insularis Reichenow

Probably too many races of this bird are recognized, but I do not think the proper way to reduce them is to consider *insularis* (Fernando Po) the same as *lühderi* (southern Cameroons and Belgian Congo), as Serle (1950, p. 626) has done. *Insularis* is the same size as *lühderi*, but the abdomen of the male is lighter gray, more yellowish. In this it is more like nominate *chloropygia* (southern Nigeria) or *kempi* (Upper Guinea), but these are smaller races. Though Bannerman may be correct in believing that birds from certain intermediate areas in Cameroons are much like *insularis*, I expect they would average smaller and doubt the wisdom of extending the range of *insularis* to the mainland. Since the type locality of *chloropygia* is an intermediate area, the feasibility of separating *kempi* from it should be reconsidered.

ZOSTEROPIDAE

WHITE-EYES

Zosterops ficedulinus ficedulinus Hartlaub *Zosterops ficedulinus feae* Salvadori

Correia obtained only two specimens of the nominate race of Principe, but found *feae* a common bird on São Tomé. Snow does not mention either.

As Moreau is now revising the African zosterops, I have not attempted to determine the mainland antecedents of this species. Sclater listed *Zosterops griseovirescens* of Anobon as a race of *ficedulinus*, but Bannerman thinks this is a mistake. *Griseovirescens* is considerably larger than *ficedulinus* but rather similar otherwise.

Speirops lugubris Hartlaub *Speirops leucophaeus* Hartlaub

Correia obtained good material of these two species, which are endemic, respectively, to São Tomé and Principe. He did not find the rare *Speirops brunneus* Reichenow of Fernando Po, known from only two specimens. We also lack the fourth form of the genus, *S. melanocephalus* of Cameroon Mountain. *Speirops* could be made a subgenus, or even a synonym, of *Zosterops* without great violence to the facts. It is, however, undesirable to expand *Zosterops* further without a revision of the entire family. *Speirops* differs from *Zosterops* in its larger average size, the

absence of yellows and greens (lipochromes) in the plumage, and perhaps to a minor degree in proportions.

Stresemann (1948, p. 334) has recently discussed the relationship of *brunneus*. He concluded that it is closer to the ordinary type of *Zosterops* than to *lugubris* and differs from the latter in its longer tail, longer, thinner bill, and in certain details of coloration. He placed *brunneus* in *Zosterops* and thinks that *Speirops*, if recognized at all, should include only the other three forms.

While it may seem somewhat presumptuous to express an opinion without having seen *brunneus* or *melanocephalus*, I find it difficult to believe that *brunneus*, an aberrant white-eye of dark brown color, large size, and with a long tail, is not related to *melanocephalus*, *leucophaeus*, and *lugubris*, which have much the same characters. The four are restricted to the islands in the Gulf of Guinea and to adjacent Cameroon Mountain; there are no zosteropids anywhere else in Africa resembling them. *Brunneus* differs from *lugubris* in its proportionately longer tail; it becomes the longest-tailed species of *Zosterops*, if it is placed in that genus.

To me it would seem most plausible to assume that these four forms are related and to attribute their differences to the usual tendency towards divergence in insular forms. The peculiar whitish color of *leucophaeus* is but one evidence of this. Possible reasons for the markedly different numerical status of the forms of *Speirops* are discussed elsewhere.

It must be emphasized that *Speirops brunneus* is the only endemic species of bird known from Fernando Po. One after another of the montane forms described from that island has been found to occur or to have subspecies on Cameroon Mountain or even, in the case of *Bradypterus lopezi*, apparently to skip the Cameroon Mountains but to have a race on Ruwenzori. The right of *brunneus* to specific status can scarcely be questioned, in view of what Stresemann has written (Bannerman had tentatively listed it, with *melanocephalus*, as a race of *lugubris*), but it is certainly reasonable to assume on zoogeographical premises that it is a representative of the *Speirops* group, with which, after all, it has considerable in common.

FRINGILLIDAE

FINCHES

Serinus mozambicus ?santhome Bannerman

This species appears to be rather oversplit racially. A revision of the mainland forms is needed before the status of the form from São Tomé can be determined. cursory comparison shows that São Tomé specimens are very similar to ones from Angola; the latter are believed to belong to the race *tando* Sclater and Praed. Certain specimens from Norther Rhodesia are also very similar to the island material. Can it be possible that this finch was introduced on São Tomé by man?

Linurgus olivaceus olivaceus Fraser

A pair taken by Correia supports the current practice of using the name *olivaceus* for both the Fernando Po and Cameroon populations.

Neospiza concolor Bocage

Correia did not obtain this São Tomé bird, which may be extinct. Chapin thinks it is a finch related to *Poliospiza*, not a weaver bird.

Poliospiza rufobrunnea G. Gray

Correia secured good material both of the nominate race of Principe and of the race *thomensis* of São Tomé. It is not possible, at least at first glance, to point to any one of the mainland species of *Poliospiza* as representing the nearest relative of *rufobrunnea*. *P. burtoni* may, however, be closest.

PLOCEIDAE

WEAVER-FINCHES

I have followed Delacour for the arrangement of the wax-bills (Estrildinae) and Chapin (unpublished) for the Ploceinae, except that several of the genera recognized by the latter are here listed as subgenera of *Ploceus*. The lumping of scores of species in the genus *Ploceus* has disadvantages, and perhaps Chapin is correct in believing that this genus, of which the species *philippinus* is the type, should be used only for Asiatic species.

Pholidornis russiae bedfordi Ogilvie-Grant

Correia obtained three specimens of this well-marked Fernando Po race.

Hypargos nitidulus virginiae, new subspecies

TYPE: A.M.N.H. No. 298108; adult male; September 8, 1929; Opu River, Fernando Po; J. G. Correia. Wing, 54; tail, 33; exposed culmen, 11.5.

DIAGNOSIS: Like *H. n. schlegeli* of West Africa (type locality, Gold Coast) but upper parts, including wing coverts (but not crown), washed with orange of the same shade as the rump, though less intense. Hence there is no contrast between rump and back. Bill entirely reddish without blackish areas at base.

An adult female taken at the same locality as the type of *virginiae* is perceptibly more yellowish on the back, wing coverts, and crown than is any of six females of *schlegeli*, though the difference is much less striking than in the male. The only other specimens of this bird from Fernando Po seem to be two immatures in the British Museum taken by Seimund. Dr. Mayr recently examined these at my request and states that they "average slightly warmer, more orange-olive, less deep olive than 7 immatures from the mainland." It is thus reasonable to assume that the much brighter color of our one adult male is not due to individual variation, for a tendency in this direction is visible in the more plainly colored females and immatures.

The new race is named for Virginia (Mrs. J. G.) Correia.

Nigrita canicapilla canicapilla Strickland

Topotypical specimens from Fernando Po have the bill a little heavier than do specimens from the mainland of Lower Guinea, but the difference is slight.

Nigrita luteifrons alexanderi Ogilvie-Grant

This Fernando Po race is set apart by color characters and larger size. As in the species last mentioned, the bill is heavier in the island than in the mainland population.

Nigrita fusconota fusconota Fraser

Our specimens from the Belgian Congo, other than the Kasai district, seem very

small, but since birds of larger size are found in Fernando Po, northern Angola, the Kasai, and Uganda, nothing would be gained by racial recognition of this irregular variation, which, moreover, requires confirmation with additional material.

Estrilda angolensis angolensis Linnaeus

Specimens from São Tomé, where the species was perhaps introduced, appear inseparable from topotypical ones from Angola.

Estrilda astrild occidentalis Jardine and Fraser

Correia secured but one specimen on Fernando Po, the type locality of this race. This is not enough to venture an opinion as to whether or not the present practice of uniting the birds of certain areas of West Africa with *occidentalis* is correct. The agreement in color is quite close, but the Fernando Po bird is rather larger (wing 49) than Cameroon and Belgian Congo specimens assigned to the same race, particularly if it is, as sexed, a female.

Estrilda astrild sousae Reichenow

Correia encountered this weaver frequently on São Tomé, the type locality, but did not secure it on Príncipe; other collectors have noted the same difference in status, though it does (or did) occur on Príncipe. Bannerman tentatively listed *sousae* as a synonym of *occidentalis*, but it is much nearer *angolensis*¹ and like that race is marked with crimson on the mid-venter.

Compared in series, the São Tomé birds appear slightly less brownish, more grayish, above and below; whiter on the throat, with the crimson of the under parts a little brighter than in *angolensis*. These distinctions are very slight and are scarcely evident at all in a few old São Tomé skins taken by Mocquers. It is possible, therefore, that "*sousae*" is nothing more than *angolensis*, perhaps introduced by man.

Estrilda thomensis Sousa

PROBABLE SYNONYM: *Estrilda cinderella* Neumann (type in American Museum examined).

¹ If *Uraeginthus* is considered a synonym of *Estrilda*, then *Estrilda astrild angolensis* is preoccupied by *Fringilla* (*Uraeginthus*) *angolensis* Linnaeus.

Estrilda thomensis was described from a single specimen said to have been obtained on São Tomé, and one more is said to have been taken later. Correia did not find it. Neumann's *E. cinderella* is also based on one specimen, taken at Deep Slood, Benguella, Angola, by Ansorge. The two are considered as probably the same by Chapin (in MS). Whether this bird was endemic to the mainland or to São Tomé or to both is uncertain. Chapin considers *caerulescens* and *perreini* specifically distinct, with *thomensis* representing probably a third allied species, all three of which he would place in *Lagonostica*. The latter is now usually considered a synonym or subgenus of *Estrilda*.

Lonchura bicolor poensis Fraser

I agree with Bannerman that it is inadvisable to recognize an intermediate race (*permista* Neumann) between *bicolor* of Upper Guinea and *poensis* of Lower Guinea. The population of Fernando Po has the white markings on the wing and rump well developed and thus agrees better with specimens from northwestern Angola and the Belgian Congo than with those from the southern Cameroons. Many specimens from the Cameroons and adjacent areas already show some reduction in these markings, which are almost completely absent in *L. b. bicolor* of Upper Guinea.

Although *bicolor* has long been used as the name for this species, Bannerman (1930-1951, vol. 7, p. 229, footnote) used *poensis* because it has line priority over *bicolor*. As Delacour (1951, p. 125) stated in discussing this action, line priority does not establish a name, according to present usage.

Lonchura cucullata cucullata Swainson

Correia obtained one immature bird, just beginning to assume adult dress, at Basoala, Fernando Po, on April 25, 1929. This is apparently the first record for that island. Correia evidently found it common on São Tomé but less so on Príncipe where he obtained only three specimens.

Ploceus (Hyphanturgus) nigricollis po Hartert

This race is doubtfully worth recognizing. The only character is that the bill of the island birds is slightly larger in all dimensions.

The difference, though slight, seems to be fairly consistent, at least in adult males. Culmen lengths are as follows: *P. n. po*: males, 18 (type of race), 18, 18.5, 18.5; females, 17, 18. *P. n. brachypterus*: males, 16.5, 17, 17, 17, 17, 17, 17.5, 17.5; females, 16.5, 16.5, 17. There is no difference in wing length.

Since *Ploceus brachypterus* and *P. nigricollis* intergrade over a large area in the Cameroons and possibly even much farther east in the Belgian Congo (cf. *Ploceus anochlorus* Reichenow, from the Uele River), they are best considered conspecific. The large area of intergradation would make it convenient to apply a name to the intermediates, but their variability, which runs the gamut from "brachypterus" to "nigricollis," has discouraged such action. Furthermore, the type locality of *anochlorus* is outside the main area of intergradation.

Ploceus (Textor) ?capitalis Latham

Correia obtained one very young weaver on São Tomé which Chapin assigns to the *capitalis-melanocephalus* group. Bocage stated that he obtained a specimen of *capitalis* on São Tomé in 1861, but in the absence of later records it was thought that this might be an error, or else based on a straggler (cf. Bannerman, 1915a, p. 100). Correia's specimen, however, indicates that *capitalis* exists on that island, whether through natural or human introduction. This may be the species Snow (1950, p. 587) observed not uncommonly and lists as *Sitagra* sp.? It is possible, however, that the birds he saw were *P. cucullatus*.

Ploceus (Textor) cucullatus cucullatus P. L. S. Müller

Specimens of the Village Weaver from Fernando Po average considerably smaller than ones from the type locality, Senegal. Wing length of males in good feather is about 84 to 87 mm. in the island birds as compared with 88 to 94 in Senegal birds. Even if there were no other populations to be considered, the difference would probably not be sufficient for racial separation. As it happens, there is a slight cline of decreasing size from Senegal to the Cameroons, birds from the latter being as small as those of Fernando Po.

Correia obtained one female of *cucullatus*

on São Tomé, where it may be a recent introduction. Though the endemic *P. grandis* belongs to the *cucullatus* group, the size difference is so great no competition would be expected.

***Ploceus (Textor) grandis* Gray**

This fine species, endemic to São Tomé, seems clearly to have been derived from *P. cucullatus*, though so much larger. The size differences are, if anything, minimized in plate 2. *Ploceus grandis* is easily the largest of the 100 odd species of the subfamily Ploceinae and is rivaled in general size in the family Ploceidae only by the three species of so-called buffalo-weavers (Bubalornithinae).

***Ploceus (Textor) princeps* Bonaparte**

It is interesting that the *cucullatus* group, entrenched on Fernando Po and São Tomé, is replaced on the intervening island of Príncipe by this member of another group of weavers. It is one of the commonest birds on Príncipe and is found nowhere else.

***Ploceus (Melanoploceus) albinucha maxwelli* Alexander**

The race *maxwelli* has been supposed to inhabit Fernando Po and Lower Guinea. As Chapin has pointed out to me, a fine series taken by Correia on Fernando Po shows that this population differs from that of Lower Guinea in having the abdomen of the fully adult plumage perceptibly grayish, while in the Lower Guinea birds the underparts are uniformly blackish. For the latter population the name *holomelas* Sassi is the oldest available.

***Malimbus rubricollis rufovelatus* Fraser**

Fernando Po birds have, in recent years, been included under the nominate race, type locality Portuguese Guinea. Hartert stated that adequate material might show that *rufovelatus* based on Fernando Po specimens is valid on the basis of the larger size of the bill. This proves to be the case, now that we have a good series taken by Correia, Seimund, and others, and which even includes one specimen from Fraser's original material. *Rufovelatus* agrees with *nigeriae* from southern Nigeria in its large size and long bill,

but agrees with the smaller nominate race in the more orange, less reddish, shade of the crown and nape.

Measurements of the various races concerned are as follows:

	WING	CULMEN
<i>nigeriae</i>		
♂	102-109	20-25
♀	97-103	19-23
<i>rufovelatus</i>		
♂	103-110	20.5-24
♀	97-105	20.5-22.5
<i>rubricollis</i>		
♂	97-104	19-21.5
♀	96, 97, 97	19, 19, 19

***Thomasophantes st.-thomae* Hartlaub**

Snow (1950, p. 587) made the interesting discovery that this peculiar São Tomé weaver climbs like a nuthatch when feeding. This makes plausible the recent suggestion of von Boetticher (1951, p. 116) that *Thomasophantes* is related to the *Notiospiza-Phormoplectes* group of weavers, which have similar habits. Von Boetticher, following Austin Roberts, believes that these genera should be transferred to the Plocepasserinae, but Chapin, who has studied the Ploceidae intensively, tells me that he is convinced that this is an error. They belong in the Ploceinae.

***Euplectes aureus* Gmelin**

Correia found this a common bird on São Tomé. That seems to be the only place where it ever has been found commonly. It has been recorded from the Loanda coast, and Colonel Vincent, so Chapin informs me, observed it near Lobito Bay, Angola. Here may be one of those rare instances in which an island bird has become established on the mainland, probably in this case through the instrumentality of man. The type supposedly came from Benguela, Angola.

***Euplectes hordaceus hordaceus* Linnaeus**

Common on São Tomé where, according to Bannerman, it was introduced about 1893.

STURNIDAE

STARLINGS

***Lamprotornis splendidus lessoni* Pucheran**

SYNONYM: *Lamprocolius chubbi* Alexander. Both these names are based on Fernando Po specimens.

No recent author has recognized the Fer-

nando Po race of this starling, but Correia's fine series makes it evident that birds from this island are larger in every way than their mainland representatives. Fully adult specimens of the two populations overlap very little, if at all, in wing measurements. I therefore recognize *lessoni*, even though the birds of Principe are again smaller and inseparable from those of the mainland. The Fernando Po birds seem to be identical in color with *L. s. splendidus*, though Alexander described *chubbi* on the basis of supposed color differences.

Of 129 specimens of *splendidus* from the mainland of Africa, only 10, all males, have the wing as long as 160 mm. These birds are mostly from the eastern part of the range: Nigeria (one), eastern Belgian Congo (two), Kenya (three), and Uganda (four). Nine of these 10 large individuals have a wing length of 160 or 161 mm., and in one Uganda specimen it is 163. It may be emphasized that most individuals of this race, even from Kenya and Uganda, have the wing 155 mm. or less. Males from Fernando Po have the following wing measurements: 159, 159, 160, 160, 161, 162, 162, 162, 163, 164, 168. The culmen length in males of *lessoni* ranges from 20.5 to 22 mm., while only two or three of the largest mainland males listed above have a culmen as long as 20.5 mm.; there is very little overlap between the two races in this dimension.

Wing lengths of nine females from Fernando Po range from 142 to 150 mm. (mean 147). Some random wing lengths of females of *s. splendidus* are as follows: Nigeria, 138, 140, 141; Cameroons, 135, 137, 138, 140; Belgian Congo, 133, 137, 138, 138, 138; Kenya, Uganda, 139, 140, 141, 143, 145.

In summary, Fernando Po examples of *Lamprotornis splendidus* are strikingly larger than those from the mainland of West Africa and appreciably larger than the birds of Kenya, Uganda, and southern Abyssinia.

Lamprotornis splendidus splendidus Vieillot

Early visitors to Principe Island reported this starling, but it was later believed that they had confused it with the more common, endemic *L. ornatus*. Correia, however, took eight specimens of *splendidus* on Principe,

thus proving that it inhabits that island, along with *ornatus*.

As stated above, Principe examples of *splendidus* are inseparable from the nominate race of West Africa, with type locality in Portuguese Guinea. Wing lengths of Principe specimens measure: males, 151, 152, 155, 156; females 139, 139, 142. The smaller size of the Principe birds, as compared with those of Fernando Po, is perhaps correlated with the presence on the former island of the somewhat larger *L. ornatus*. Another possibility is that the species reached Principe from the mainland recently. Adult males from Fernando Po and Principe are figured in plate 3.

Lamprotornis ornatus Daudin

This fine starling, endemic to Principe, agrees with *splendidus* and differs from all other members of its genus by having well-developed notches on the inner vanes of several of the longer primaries. Hence there can be no doubt that *ornatus* represents an earlier invasion of *splendidus* stock on Principe, and the presence there of *splendidus* is due to a double colonization or "invasion." Unfortunately, we know nothing of the ecological interplay of the two on Principe, except that *ornatus* seems to be far more numerous.

Onychognathus walleri preussi Reichenow

Correia secured a small series of this starling on Fernando Po. For comparison, I have a pair taken at the type locality, Buea on Mt. Cameroon, by Preuss. They are in poor condition, but so far as I can see do not differ from the Fernando Po material. Others have already concluded that the two populations are not separable.

Onychognathus fulgidus hartlaubii G. R. Gray

The type locality, "Fernando Po," has been in doubt for many years. Correia, however, obtained 10 specimens there. They agree in size with birds from Lower Guinea; hence, the name *hartlaubii* (not *intermedius*) will apply to this population. The name *harterti* (Gold Coast) can be used for the birds of Upper Guinea if they prove sufficiently smaller to warrant separation.

Wing lengths of the Fernando Po birds

are: six males, 134-137; four females, 122-129. We have only three birds from Upper Guinea, all from the Gold Coast; two males seem small, but the plumage is not in good condition. The third specimen, a female, is as large as many females of *hartlaubii*. Bannerman and others, however, have found Upper Guinea examples of this starling to be of small size. A series from southern Nigeria has the primaries mostly rather worn; the inner ones are already molting. Making allowance for this, they seem to be only a little smaller than *hartlaubii*.

***Onychognathus fulgidus fulgidus* Hartlaub**

This very distinct large, long-billed race is endemic to São Tomé. The genus is absent on Príncipe. Specimens of *hartlaubii* and *fulgidus* are contrasted in plate 3.

ORIOLIDAE

ORIOLES

***Oriolus nigripennis nigripennis* J. and E. Verreaux**

This oriole occurs on Fernando Po, but Correia did not obtain it. In an examination of our material, it was evident that four birds from Sierra Leone were smaller, and the male less golden above, than Lower Guinea specimens. Examination of two males and a female of this species, collected in Liberia by the late G. M. Allen and borrowed from the Museum of Comparative Zoölogy, confirmed these differences, which parallel those found in the Upper and Lower Guinea races of *Oriolus brachyrhynchus*. Rand (1951, p. 634) also called attention to the characters of the Upper Guinea population.

The name *nigripennis*, with type locality Gaboon, belongs to the Lower Guinea form. Apparently the only other name ever applied to this species was *lucostictus*, used by Reichenow for a variant from Beni, Belgian Congo. There is no name for the Upper Guinea race, which may be called

***Oriolus nigripennis alleni*, new subspecies**

TYPE: Museum of Comparative Zoölogy No. 236431; adult male; October 24, 1926; Bangah, Liberia; G. M. Allen. Wing, 117; tail, 82; culmen, 24.

DIAGNOSIS: The adult male of *alleni* differs from that of the nominate race in that the upper parts are yellowish green or olive, not

rich golden yellow. In this respect the male of *alleni* is like the female of nominate *nigripennis*. Only one of the examined specimens of *alleni* is sexed as a female, and even it may, judging from its size, be a mis-sexed male. This specimen is not appreciably duller than known males of *alleni*. *Alleni* is a somewhat smaller race than *nigripennis*. Its bill is, on the average, not so stout, but there is little difference in the length of the culmen in the two forms.

RANGE: Upper Guinea; specimens examined from Sierra Leone and Liberia. Three Cameroons birds are, as might be expected, nearest the Lower Guinea race, though the bill seems rather small. The Fernando Po population presumably also belongs with *n. nigripennis*.

REMARKS: When one compares a series of males and females of this oriole from Lower Guinea, the bright golden yellow of the upper parts of the male contrasts greatly with the much greener and duller upper parts of the female. I assume, therefore, that Bannerman's (1930-1951, vol. 5, p. 462) failure to mention any difference in the sexes indicates that he based his description largely on material from Upper Guinea in which the sexual differences are absent or much reduced.

The measurements are:

Oriolus nigripennis nigripennis

Wing, 6 ♂, 119-124 (121); 4 ♀, 117-121 (119)
Culmen, 9 ♂, 23-25 (23.9); 5 ♀, 22-24 (23.2)

Oriolus nigripennis alleni

Wing, ♂, 111, 112, 117 (type); ♀, 114; sex?, 111, 113
Culmen, ♂, 21, 21, 24; ♀, 24; sex?, 20, 21, 21

***Oriolus crassirostris* Hartlaub**

This São Tomé oriole appears to be an insular representative of *Oriolus brachyrhynchus* of West Africa. The lipochromes have almost disappeared from its plumage, though some pale yellowish hues remain in the tail. The retention of *crassirostris* as a species is dictated not only by its whitish coloration but also by its very heavy bill. *Brachyrhynchus* and *crassirostris* form a superspecies. Although the color distinctions of *crassirostris* as compared with *brachyrhynchus* are not visible in plate 2, the general robustness of the island species is apparent.

LISTS OF THE BIRDS OF THE FOUR ISLANDS

LISTS OF THE RESIDENT land and fresh-water birds of the four principal islands in the Gulf of Guinea are given below. Migrants, oceanic birds, and introduced species (except in doubtful cases) have been excluded. Previous lists, with bibliographies, were published by Alexander (1903), and by Bannerman (1914, 1915a, and 1915b). In the following lists the names of forms endemic to one island have been italicized. The term "not examined" means only that no specimens from the island in question were examined.

FERNANDO PO

- Bubulcus ibis ibis
 Egretta gularis gularis
 Bostrychia hagedash brevirostris
 Milvus migrans parasitus (not examined)
 Accipiter tachiro *lopezi*
 Gypohierax angolensis
 Pseudogyps africanus (not examined)
 Treron calva *poensis*
 Columba arquatrix sjöstedti (new to island)
 Streptopelia semitorquata semitorquata
 Tympanistria tympanistria
 Aplopelia larvata *poensis* (not examined; valid?)
 Psittacus erithacus erithacus
 Agapornis pullaria pullaria (not examined)
 Turacus macrorhynchus verreauxi
 Turacus persa buffoni (not examined)
 Corythaeola cristata
 Ceuthmochares aereus aereus
 Cuculus solitarius *magnirostris* (described in this paper)
 Chrysococcyx cupreus cupreus
 Chrysococcyx caprius
 Chrysococcyx klaasi klaasi
 Tyto alba *poensis* (valid?)
 Bubo poensis poensis
 Apus affinis bannermani
 Apus myoptilus poensis (specific assignment by J. P. Chapin)
 Apus barbatus sladeniae (specific assignment by J. P. Chapin)
 Cypsiurus parvus brachypterus (not examined)
 Chaetura cassini (new to island)
 Heterotrogon vittatus camerunensis (not examined)
 Alcedo leucogaster *leucogaster*
 Halcyon senegalensis ?fuscopileus (not examined; a resident?)
 Halcyon badia *lopezi* (valid?)
 Melittophagus mülleri mentalis
 Eurystomus gularis neglectus
- Ceratogymna atrata
 Pogoniulus scolopaceus *stellatus*
 Pogoniulus subsulphureus subsulphureus
 Pogoniulus leucolaima *poensis* (not examined; valid?)
 Indicator exilis *poensis*
 Campethera nivosa *poensis* (valid?)
 Mesopicos johnstoni *schultzei* (not examined)
 Smithornis sharpei *sharpei*
 Psalidoprocne fuliginosa
 Coracina caesia preussi (not examined)
 Andropadus virens virens
 Andropadus latirostris latirostris
 Andropadus gracilirostris gracilirostris
 Andropadus tephrolaemus tephrolaemus
 Calyptocichla serina
 Phyllastrephus poensis
 Phyllastrephus icterinus tricolor
 Bleda eximia notata
 Criniger calurus calurus
 Fraseria ocreata ocreata
 Muscicapa seth-smithi (new to island)
 Muscicapa adusta obscura
 Megabyas flammulatus flammulatus (new to island)
 Batis poensis
 Dyaphorophya castanea castanea
 Dyaphorophya blissetti chalybea
 Trochocercus albiventris albiventris (not examined)
 Tersiphone rufiventris *tricolor*
 Malacocincla cleaveri *poensis* (not examined)
 Malacocincla rufipennis *bocagei*
 Alcippe abyssinica *claudeii*
 Macrosphenus concolor
 Macrosphenus flavicans flavicans
 Eremomela badiceps badiceps
 Apalis cinerea *sclateri*
 Apalis rufogularis rufogularis
 Apalis (Poliolais) *lopezi lopezi*
 Urolais epichlora *mariae*
 Camaroptera superciliaris *superciliaris*
 Camaroptera chloronota *granti*
 Brachypterus *lopezi lopezi*
 Calamocichla rufescens rufescens (not examined)
 Seicercus herberti *herberti*
 Alethe castanea castanea
 Alethe poliocephala poliocephala (perhaps endemic)
 Stiphornis erythrothorax gabonensis
 Cossypha roberti roberti (mainland record: Serle, 1950, p. 608)
 Cossypha insulana *insulana*
 "Cossypha" poliothorax¹ (not examined)

¹ Placed in or near *Cossypha* by Delacour, but considered to be a babbler, genus *Malacocincla*, by Chapin.

Saxicola torquata pallidigula (not examined)
Neocossyphus poensis poensis
Stizorhina fraseri fraseri
Turdus olivaceus poensis
Laniarius poensis poensis
Hylia prasina poensis (valid?)
Anthreptes fraseri fraseri
Anthreptes rectirostris tephrolaema
Anthreptes collaris hypodilus
Cyanomitra seimundi seimundi
Cyanomitra olivacea obscura
Cyanomitra oritis poensis
Cyanomitra cyanolaema cyanolaema
Cyanomitra batesi (probably endemic race; new to island)
Chalcomitra ursulae (not examined)
Chalcomitra rubescens stangerii
Nectarinia preussi preussi
Nectarinia chloropygia insularis
Nectarinia minulla (new to island)
Zosterops senegalensis stenocircata
Speirops brunneus (not examined)
Linurgus olivaceus olivaceus
Pholidornis rushiae bedfordi
Cryptospiza reichenovii reichenovii (not examined)
Hypargos nitidulus virginiae (described in this paper)
Nigrita canicapilla canicapilla
Nigrita luteifrons alexanderi
Nigrita fusconota fusconota
Nesocharis shelleyi shelleyi
Estrilda astrild occidentalis (endemic?)
Estrilda nonnula elizae (not examined; valid?)
Lonchura cucullata cucullata (new to island)
Lonchura bicolor poensis
Vidua macroura
Ploceus (Hyphanturgus) melanogaster melanogaster (not examined)
Ploceus (Hyphanturgus) nigricollis po (valid?)
Ploceus (Textor) cucullatus cucullatus
Ploceus (Melanoploceus) maxwelli maxwelli
Ploceus (Symplectes) bicolor tephronotus (not examined)
Malimbus rubricollis rufovelatus
Phormoplectes insignis unicus (not examined; see Stresemann, 1948)
Quelea erythroptus
Lamprocolius splendidus lessoni
Poeyoptera lugubris lugubris (not examined)
Onychognathus walleri preussi
Onychognathus fulgidus hartlaubii
Oriolus nigripennis nigripennis (not examined)
Dicrurus adsimilis coracinus
Corvus albus

SOME SPECIES REPORTED FROM FERNANDO PO,
APPARENTLY OR CERTAINLY IN ERROR

Xiphidiopterus albiceps
Halcyon malimbica subsp.
Phyllastrephus albigularis
Chlorophoneus sulfureopectus
Lamprotornis purpureus

SPECIES ADDED TO THE AVIFAUNA OF
FERNANDO PO BY CORREIA

Columba arquatrix sjöstedti
Chaetura cassini
Muscicapa seth-smithi
Megabyas flammulatus flammulatus
Cyanomitra batesi subsp.
Nectarinia minullus minullus
Lonchura cucullata cucullata (possibly introduced)
Motacilla flava thunbergi (migrant)

PRINCIPE ISLAND

Butorides striatus atricapillus
Egretta gularis gularis
Bostrychia olivacea rothschildi (not examined; extinct? valid?)
Treron calva virescens (described in this paper)
Columba malherbii malherbii
Aplopelia larvata principalis
Psittacus erithacus erithacus
Agapornis pullaria pullaria (not examined; extirpated)
Chrysococcyx cupreus insularum
Micropus affinis bannermani
Cypsiurus parvus brachypterus (not examined)
Alcedo leucogaster nais
Ceryle rudis (not examined; extirpated? straggler?)
Halcyon malimbica dryas
Riparia cincta cincta (not examined; off-season straggler?)
Horizorhinus dohrni
Turdus olivaceofuscus xanthorhynchus
Cyanomitra olivacea obscura
Cyanomitra harilaubii
Speirops leucophaeus
Zosterops ficedulinus ficedulinus
Poliospiza rufobrunnea rufobrunnea
Nigrita bicolor brunnescens (not examined; introduced?)
Estrilda astrild sousae
Lonchura cucullatus cucullatus
Quelea erythroptus
Ploceus (Textor) princeps
Lamprotornis splendidus splendidus
Lamprotornis ornatus
Dicrurus adsimilis modestus

SÃO TOMÉ ISLAND

Phalacrocorax africanus africanus
Butorides striatus atricapillus
Egretta gularis gularis
Bubulcus ibis ibis
Bostrychia (olivacea) bocagei
Milvus migrans parasitus
Coturnix delagorguei histrionica
Crex egregia
Rallus caerulescens (not examined)
Gallinula chloropus brachyptera
Treron (australis) s.thomae
Columba (arquatrix) thomensis
Columba malherbii malherbii
Streptopelia senegalensis senegalensis
Aplopelia larvata simplex
Agapornis pullaria pullaria
Clamator jacobinus pica (straggler? new to island)
Chrysococcyx cupreus insularum
Tyto alba thomensis
Otus scops harilaubii
Micropus affinis bannermani
Chaetura (sabini) thomensis
Alcedo leucogaster thomensis
Terpsiphone atrochalybeia
Amaurocichla bocagei
Prinia molleri
Turdus olivaceofuscus olivaceofuscus
Lanius newtoni
Cyanomitra newtoni

Cyanomitra thomensis
Speirops lugubris
Zosterops ficedulinus feae
Polioptila rufobrunnea thomensis
Neospiza concolor (not examined; genus valid?)
Serinus mozambicus santhome (valid?)
Estrilda astrild sousae
Estrilda (perreini) thomensis (not examined; really from São Tomé?)
Lonchura cucullatus cucullatus
Vidua macroura
Ploceus (Sitagra) capitalis (introduced?)
Ploceus (Textor) grandis
Ploceus (Textor) cucullatus subsp. (probably introduced; new to island)
Thomasophantes st.-thomae
Euplectes aureus (species endemic?)
Quelea erythropus
Onychognathus fulgidus fulgidus
Oriolus crassirostris

ANNOBON ISLAND

Butorides striatus atricapillus
Egretta gularis gularis
Milvus migrans parasitus
Gallinula chloropus brachypterus
Columba malherbii malherbii
Aplopelia larvata hypoleuca
Otus scops feae
Terpsiphone (?rufiventer) newtoni
Zosterops griseovirescens

ZOOGEOGRAPHY

THIS SECTION PRESENTS merely a few general remarks. Other comments on this subject are given throughout the Systematic Notes (e.g., under *Butorides striatus*) or in the next section, Some Evolutionary Factors.

Fernando Po, which was undoubtedly connected with the mainland at no very remote time in the past, has an avifauna similar to that of West Africa, but which is considerably more limited. A list of the avifauna of a comparable area on the mainland in the vicinity of Mt. Cameroon (to encompass an equal altitudinal range) would be much longer than the list of Fernando Po birds. The reasons for this are discussed below in a consideration of why the avifaunas of islands are limited and impoverished. The nearness of Mt. Cameroon to the highlands of Fernando Po has resulted in great similarity between the montane, as well as the lowland, avifauna of the two areas. If there had been no Mt. Cameroon in adjacent West Africa we would probably find greater endemism on Clarence Peak of Fernando Po.

In regard to the problem of the faunal influence of Fernando Po upon the outer islands, it is evident from the map that the distance from Principe to Fernando Po is about equal to the distance from Principe to the coast of West Africa. Since the mainland is so much larger, it is not surprising that in very few species can we detect a direct relationship between the races of Principe and of Fernando Po. The slight endemism of the Fernando Po avifauna is another difficulty; for example, we cannot determine whether *Psittacus e. erihacus* reached Principe from Fernando Po or from the mainland, since this race frequents both areas.

Among the few examples of direct relationship in the avifaunas of these two islands is the race of sunbird, *Cyanomitra olivacea obscura*, common to Fernando Po and Principe but replaced by another race on the mainland. Another case is the swift, *Apus affinis bannermani*, which is found on São Tomé, Principe, and Fernando Po and replaced by other races on the mainland, though material from the mainland opposite Fernando Po should be examined to confirm this. The species is known on Fernando Po only

from a mummified adult (typical *bannermani*) which Chapin picked up beneath the nests of a colony utilizing a building in the town of Santa Isabel. It is possible that this species has only recently colonized Fernando Po, presumably from Principe.

The recently described race of Emerald Cuckoo, *Chrysococcyx cupreus insularum* Moreau and Chapin, is endemic to São Tomé and Principe; the population of Fernando Po is intermediate. Of this race its describers write (1951, p. 178): "The Emerald Cuckoos of the Gulf of Guinea islands occupy a highly peculiar position in the insular avifaunas. They provide the only example of a land species common to all three islands and of a land subspecies common to two. And there appears to be no parallel case of a Fernando Po population being intermediate between an insular and a continental form." While the first of these statements, at least, seems to be correct, I think it is overemphasis to call the variation of this cuckoo in the Gulf of Guinea islands "highly peculiar." The situation in *Micropus affinis bannermani* may prove to be similar after adequate material from Fernando Po is available. *Alcedo l. leucogaster* of Fernando Po combines the large size of the races of Principe and São Tomé with the color of *batesi* of the Cameroons and is thus intermediate, though here a remarkable factor is the appearance in the two races of the outer islands of a crest similar to that of the rare *A. leucogaster leopoldi* of the Belgian Congo. *Aplopelia larvata* may be another species in which the Fernando Po form, once its characters are sufficiently known, will be found intermediate. This may also have been the case in the *Speirops* group, but the forms are too differentiated now for that to be proved. The geographical position of the islands is such that an appreciable number of the birds of Principe probably were derived from Fernando Po. Much of the colonization of Principe (and Fernando Po) may have occurred at a period when Fernando Po was an integral part of the West African mainland. In a few cases the absence or apparent absence of a species or group on Fernando Po indicates beyond much doubt that the colonization of the outer

islands took place directly from the mainland. Examples are the *Cyanomitra* (*Anabathmis*) group of sunbirds and the *Columba malherbii-iriditorques* pigeons.

As is well known, Upper Guinea and Lower Guinea frequently have different races of West African birds (see especially Bates, 1931). The most frequent area of demarcation between them lies in the general vicinity of Mt. Cameroon (see Rand, 1951). Fernando Po lies just slightly south of the Mt. Cameroon area, and for this reason the majority of its birds agree with the forms of Lower Guinea. There are a few exceptions, such as the bee-eater *Merops mulleri*, of which the Upper Guinea race, *mentalis*, is the one found on Fernando Po.

The avifaunas of the three outer islands, unlike the avifauna of Fernando Po, are very limited and "oceanic" in character. Endemism is high and includes endemic genera, two of which present difficulties even as regards family allocation. Since these islands, or at least Principe and São Tomé, are as near to the mainland as to one another, it is not surprising that their avifaunas are composed on the whole of very different species. Snow (1950), in particular, has emphasized that the dominant birds of Principe (*Ploceus princeps*, *Horizorhinus dohrni*, *Lamprocolius ornatus*, and a few others) are absent on São Tomé where they are replaced by such dominant or highly endemic forms as *Prinia mulleri*, *Thomasophantes st.thomae*, *Terpsiphone atrochalybeia*, *Lanius newtoni*, *Oriolus crassirostris*, *Amaurocichla bocagei*, and others. These differences, it must be admitted, may be partly due to ecology; some of the savanna birds of São Tomé may have been unable to establish themselves on Principe, even if they did on one or more occasions reach that island.

It is not difficult to point to avifaunal ex-

changes and similarities between these two islands. *Columba malherbii malherbii* and *Chrysococcyx cupreus insularum* are common to São Tomé and Principe. Even more important is the existence of a number of species (or superspecies) endemic to Principe and São Tomé though not represented by the same race on each: *Turdus olivaceofuscus*, *Zosterops ficedulinus*, and *Poliospiza rufobrunnea*. Snow found that, so far as actual individual representation is concerned, the differences are more striking than the resemblances. This, however, may be to some extent the result of the decimation by man of certain woodland species, such as *Turdus olivaceofuscus*. It is probable that Principe served as a springboard or basis of colonization for the double invasion of São Tomé by *Cyanomitra* stock, represented now by *harilaubii* on Principe and by *newtoni* and *ihomensis* on São Tomé. *Neospiza concolor* and *Poliospiza rufobrunnea* of São Tomé, if they represent a double invasion by the same ancestral stock, probably arrived there from Principe also.

What little can be said of the zoogeography of Annobon is more or less self-evident from inspection of the list of resident birds. *Columba malherbii* doubtless came from São Tomé, as probably did several of the others (*Gallinula*, *Aplopelia*, *Milvus*, *Egretta*, *Butorides*), although the only reason for suggesting this in most cases is that São Tomé is nearer to Annobon than is the mainland. The Annobon race of *Otus scops* apparently lacks the bare tarsi of the race *harilaubii* of São Tomé and may represent an independent colonization from the mainland. This is certainly the case with *Terpsiphone newtoni*, which is related to, and may even be a race of, *T. rufiventer*, whereas *T. atrochalybeia* belongs to the *viridis* group. Fernando Po, as does Annobon, has a member of the *T. rufiventer* group.

SOME EVOLUTIONARY FACTORS ENDEMISM

THE PER CENT OF ENDEMISM on the various islands can be calculated from the above lists in which the names of endemic forms are italicized. The data exclude marine species and migrants.

Fernando Po has no endemic genera. Of 133 recorded species, only one (*Speirops brunneus*) is endemic. Of the remaining 132 species, 42 are non-passerine, and of these 12 (29 per cent) are represented by endemic subspecies. Of the 90 passerine species, 32 (36 per cent) represent endemic subspecies. Thus 44 of the 132 species, or 33 per cent, have endemic subspecies. (As noted in the systematic section a few others, such as *Cyanomitra batesi* and *Alcipe poliocephala*, may have endemic races on Fernando Po. There may be, on the other hand, a few undiscovered species that are not differentiated, so that the percentages as given are about correct.)

Of the 28 genera represented on Principe, one genus (*Horizorhinus*) is endemic. Fourteen non-passerine and 16 passerine species occur on this island; of these none of the non-passerines is endemic, but five of the passerines (31 per cent) are. In all, 17 per cent of the 30 species are endemic. Of the remaining species, five of the 14 non-passerines (36 per cent) and four of the 11 passerines (36 per cent) represent endemic subspecies. Thus nine of the 25 non-endemic species (36 per cent) are endemic at the racial level. The total endemism at either racial or specific level is 14 of 30 species, or 47 per cent.

Three of the 42 genera (7 per cent) known

from São Tomé are endemic. They are all passerine (*Amaurocichla*, *Neospiza*, *Thomasophantes*). At least one other endemic genus (*Dreptes*) is widely recognized, though it is here regarded as a synonym of *Cyanomitra*.

At the species level two of 23 non-passerines (9 per cent) and 12 of 24 passerines (50 per cent) are endemic. Several are borderline cases taxonomically, but these figures represent average treatment. In all, 14 of the 47 species found on the island are endemic (30 per cent).

Of the remaining 33 species, seven of 21 non-passerines (33 per cent) and six of 12 passerines (50 per cent) are endemic. The total is 13 of 33, or 39 per cent endemic races. Total endemism at either racial or specific level is 27 of 47 species, or 57 per cent. The above figures are summarized in table 1, in which the figures for Annobon are also presented.

If one can judge from present status of the avifauna, the isolation of Fernando Po is sufficient to permit subspeciation in many birds, particularly small passerine species, but enough interchange with the mainland occurs to keep the variation at the subspecific level (or below), with rare exceptions. It must be remembered, however, that Fernando Po is not only less isolated than the other Guinea islands but also that this isolation, such as it is, has been of much shorter duration. It is quite possible, even under the present degree of isolation, that many of the more sedentary species would eventually attain specific or even generic distinctness on Fernando Po.

TABLE 1
DEGREE OF ENDEMISM ON THE GULF OF GUINEA ISLANDS

Island	Per Cent of Endemic Genera	Per Cent of Endemic Species	Per Cent of Endemic Species and Subspecies Combined
Fernando Po	0	0.75	34
Principe	4	17	47
São Tomé	7	30	57
Annobon	0	22	44

As regards the composition of the Fernando Po avifauna, it will be noted that it is more balanced than the avifaunas of the outer islands. More of the mainland families are represented. This would be true of such a slightly isolated island regardless of whether or not it had once been connected with the mainland. Actually, it is surprising that the avifauna of Fernando Po is as limited as it is. For example, only one species of hornbill and only one genus of barbet are present, and the Accipitridae are very meagerly represented. These absences are presumably due in many cases to ecological reasons rather than to isolation.

Few species of birds have been able to reach isolated Principe and São Tomé, and these few have, in many cases, become highly differentiated. The contrast with Fernando Po is much greater when species and genera are compared, because Fernando Po has enough endemic subspecies (though usually poorly differentiated) to suggest a rather high level of endemism. The peculiarities of Principe and São Tomé are even more evident when the two are considered as a unit. A number of distinctive species (*Turdus olivaceofuscus*, *Zosterops ficedulinus*, *Poliospiza rufobrunnea*) are represented on both islands but not elsewhere.

The greater isolation of these two islands has permitted a few examples of double colonization. They are *Lamprotornis ornatus* and *L. s. splendidus* on Principe and, on

São Tomé, *Cyanomitra thomensis* and *C. newtoni*. Perhaps *Neospiza concolor* evolved from an earlier colonization on São Tomé of the stock now represented by *Poliospiza rufobrunnea*, which has a race on São Tomé. The presence on São Tomé of *Ploceus grandis* and *P. cucullatus* also suggests a double invasion, but since *cucullatus* is known from São Tomé only by one specimen, taken by Correia, it is probable that its arrival there was very recent; perhaps it was introduced by man.

The endemic birds of São Tomé and Principe exhibit many levels of differentiation. The process of colonization is one that began long ago and has continued to the present. *Clamator cafer*, for example, which Correia recorded on São Tomé for the first time, is a species that might become established there, if, indeed, it has not already done so.

The absence on the Guinea islands of any radiations comparable, for example, with those of the Galápagos finches (Geospizinae) may be attributed to the linear arrangement of the islands and the long distances separating them, factors that do not favor the origin of numbers of sympatric species. Furthermore, these islands are not so isolated as, for example, the Galápagos or Hawaiian Islands, and the number of mainland types represented is somewhat greater, thus reducing the number of empty ecological niches available.

EVOLUTION OF COLOR AND PLUMAGE

Color variation in the subspecies endemic to Fernando Po shows no definite trends. Perhaps a majority of its races, where there is a color difference, are paler or duller than the mainland birds, but there are almost as many of which the opposite is true (e.g., *Treron calva poensis* and *Hypargos nitidulus virginiae*). *Camaroptera s. superciliaris* is brighter than the race of the adjacent mainland, but *C. chloronota granti* is paler.

As regards the endemics of Principe and São Tomé, an over-all appraisal reveals the presence of many forms in which the colors are more subdued and the patterns less sharply defined than in related mainland forms. In some instances this results in a

secondarily immature appearance as in *Turdus olivaceofuscus xanthorhynchus* of Principe, with its mottled breast. São Tomé forms in which such changes are apparent are *Columba thomensis* (reduction of white spots and check-marks of *C. arquatrix*), *Treron s. thomae* (plumage dull colored), *Tyto alba thomensis* (dark, heavily pigmented), *Cyanomitra thomensis* (reduction of metallic areas and of plumage contrasts), and *Oriolus crassirostris* (pattern retained, but lipochromes reduced, to produce a whitish bird). In some of the more highly endemic forms, where it is not possible to point to a definite mainland representative, the same "insular" plumage type is nevertheless apparent or probable.

Examples are *Horizorhinus dohrni*, *Thomasophanties st.-thomae*, and *Speirops lugubris* and *leucophaeus*.

In many cases insular modification of the plumage involves softness and laxness of the feather structure. When an insular species adopts a more generalized mode of life than its mainland relatives, secondary acquisition of primitive or generalized features in the external morphology (bill, feet) may serve to accentuate the changes in the plumage. *Horizorhinus dohrni*, for example, has a nondescript appearance, making it difficult to decide whether it is a babbler, a thrush, or a flycatcher. It is most likely that this primitive or generalized assemblage of characters was acquired in large part after this bird reached Principe, and that it is not primitive in the sense of being a relict form.

The plumage and color changes in some of the birds of São Tomé and Principe are of general but by no means universal occurrence in the birds of oceanic islands. They are probably to be attributed in many cases to the gradual loss of plumage patterns that once served, on the mainland, as species recognition marks. It is significant that in island birds in which there are sympatric species such changes are usually not in evidence. Such is the case in the Hawaiian honeycreepers (Drepanididae), in which up to 15 species occurred on a single island (Amadon, 1950). The contrasting color pattern of *Cyanomitra newtoni* of São Tomé, which is greater than that of any other species of the subgenus *Anabathmis*, may be attributed to the fact that São Tomé is the only area where two species of this subgenus are present.

The softness or laxness of the feather structure of many insular birds is doubtless the result of lessened importance of flight. The presence of a woolly or downy type of body plumage in flightless birds belonging to such diverse groups as rails, cormorants, and ratites makes it evident that loss or impairment of flight affects the body plumage as much as, or in some cases even more than, it does the flight quills. When the plumage becomes soft and lax, this in itself has an effect upon color pattern.

The absence of predators upon oceanic islands, it might be supposed, permits the evolution of ornamental plumes and brilliant colors in greater excess than on continents. That this is rarely the case suggests that such ornamentation usually serves primarily to keep species apart, rather than to enhance intraspecific sexual selection in the Darwinian sense. Where sympatric related species are absent, such development usually does not occur.

As on Fernando Po, color variation among the endemics of Principe and São Tomé shows no very definite trends. *Speirops leucophaeus* of Principe is almost whitish, but *lugubris* of São Tomé, like the forms of Fernando Po and Mt. Cameroon, is heavily pigmented. *Alcedo leucogaster thomensis* is a heavily pigmented form, with a blackish immature plumage that is absent in the related forms. On the other hand, *Oriolus crassirostris* of the same island is an aberrant oriole in which the rich golden hues of the related mainland forms have been almost entirely lost, and only pale whitish and yellowish tints remain. The two related sympatric mainland species *O. brachyrhynchus* and *O. nigripennis* both have a pale race in Upper Guinea and a more richly colored one in Lower Guinea. The parallel geographical variation suggests that the orange and yellow lipochromes, which are known to be very subject to physiological factors (such as pigment content of the food, etc.) may be responding to changing environmental factors. A similar cause could be responsible for the further decrease of lipochromes in *O. crassirostris* under insular conditions, but this is not meant to suggest that in such a highly differentiated form the observed color differences do not at present have a genetic basis. (Mertens, 1934, has discussed the possible effects of sea salts and dietary changes in producing melanism and other color modifications in insular lizards.)

Conspicuous melanism or albinism, such as occurs in the avifauna of New Zealand and some other islands, does not occur in the avifauna of the Gulf of Guinea islands.

VARIATION IN GENERAL SIZE

There is a very evident trend towards large size in the birds inhabiting Fernando Po. Attempts to put this in statistical terms encounter difficulties. *Treron calva poensis*, for example, is larger than the race of the adjacent mainland, but it resembles in color the race *ansorgei* of Angola, which is larger even than *poensis*. It is possible that some shift in the distribution of the mainland races has occurred since the species reached Fernando Po and that no increase in size took place on that island. *Malimbus rubricollis rufovelatus*, to mention another example, agrees with the race *nigeriae* of southern Nigeria in being of large size, but the color of the head is as in the smaller nominate race of the Cameroons and south. It is impossible to say whether or not an increase in size occurred on Fernando Po, but in this case it would seem most likely that it did.

Another difficulty is provided by the numerous species in which Fernando Po birds are slightly larger than those of the adjacent West African lowlands, but are equaled or exceeded in size by those from the perimeters of the range of the same race in northern Angola and in the eastern Belgian Congo or adjacent forested areas in Kenya and Uganda. This pattern of size variation on the continent is usually attributed to a Bergmann rule effect; the birds increase in size farther from the Equator, but the fact that Upper Guinea races are often smaller (Bates, 1931) does not fit well with this explanation. Bates suggested that the size decrease might be correlated with the deterioration of the forests of Upper Guinea because of decreasing rainfall, which would tend to reduce the amount of food available to forest birds.

With these reservations, it may be stated that about 20 of the approximately 135 species of birds recorded from Fernando Po average larger in size than their mainland counterparts. This includes a few such as *Cyanomitra batesi* in which the island form has not been separated racially, although such action may eventually prove desirable when more material is available. All but two or three of these 20 forms are passerines. A number of Fernando Po races differ from the

nearest mainland form primarily in being larger, i.e., there is no color difference. In most of these, however, the difference in size of the bill is somewhat greater relatively than that in over-all size, so it is not correct to say that the race is based exclusively on the latter. Races that have no color differences and are larger in general size include *Alcedo l. leucogaster*, *Anthreptes f. fraseri*, *Cyanomitra s. seimundi*, and *Lamprotornis splendidus lessoni*.

Very few Fernando Po birds are smaller than their mainland representatives. The only race based exclusively on smaller size is *Mesopicos johnstoni schultzei*, which I have not seen (Stresemann, 1948). The difference is slight. *Turdus olivaceus poensis*, also not represented in the American Museum, seems to be slightly smaller than the allied *nigrilorum* of Mt. Cameroon, judging from measurements given by Bannerman.

Several of the forms endemic to Principe are larger than their nearest relatives, and none is conspicuously smaller except *Turdus olivaceofuscus xanthorhynchus*, which, however, has its allied race on São Tomé, not on Fernando Po or the mainland. Among the species represented by large forms on Principe are *Halcyon malimbica dryas*, *Lamprotornis ornatus*, and *Dicrurus adsimilis modestus*. Two Principe forms, *Lamprotornis s. splendidus* and *Treron calva virescens*, are smaller than the Fernando Po races, but this may in both cases be due to independent colonization from the mainland and not to size decrease on Principe.

Size variation on São Tomé is similar to that on Principe. Whenever a size difference exists it is usually an increase. Notable examples are *Treron s. thomae*, *Columba thomensis*, *Cyanomitra thomensis*, *Ploceus grandis*, *Onychognathus f. fulgidus*, and *Oriolus crassirostris*. Species in which size has seemingly decreased on São Tomé are *Bostrychia bocagei*, *Tyto alba thomensis*, *Lanius newtoni*, and *Cyanomitra newtoni*.

It remains to discuss some of the possible causes of the evolutionary changes in size outlined above. In a few cases they may with some confidence be attributed to competition for food between allied, sympatric species.

Examples are *Cyanomitra newtoni* (small) and *C. thomensis* (large) and perhaps *Polioptila rufobrunnea* and *Neospiza concolor* on São Tomé and *Lamprotornis s. splendidus* and *L. ornatus* on Principe. In each of these cases, the first arrival, judging by degree of differentiation, is the larger, suggesting that some size increase had occurred before the arrival of a second species of the same genus.

It is more difficult to explain the frequent size increases which have occurred in the absence of competition with closely allied forms. Enough exceptions occur to make it doubtful whether any general environmental factor favoring large size can be invoked. As noted above, the climate of the Gulf of Guinea islands is slightly cooler than that of the adjacent West African lowlands. This, together with the fact that mountain forms often occur at lower levels on islands than on continents, suggests that the larger size of some insular forms may be a response to a cooler climate, i.e., they may illustrate Bergmann's rule. This would certainly not be the case, however, for the more extreme variants. The numerous exceptions to the trend towards larger size, and the fact that on Fernando Po and many other islands the mammals, unlike the birds, average smaller rather than larger than mainland forms (Krumbiegel, 1943), make it doubtful that any of the size differences noted can be ascribed to meteorological differences. It is also significant that size increases on Fernando Po are common among the members of some families but absent in others. This would scarcely be expected if the cause of size increase on the island is of a general environmental nature.

Both of the races mentioned above in which the form on Fernando Po is smaller than that of the mainland belong to montane species. It seems to be true that highland species are less apt than lowland species to show an increase in size on Fernando Po, but the meager representation of high-altitude species in the material studied, both from Fernando Po and Mt. Cameroon, made it difficult to investigate this point. This conclusion is further supported by the fact that the size of subspecies that are common to Mt. Santa Isabel and Cameroon Mountain

is sometimes smaller than that of races of the same species from other mountains in Africa. *Nesocharis s. shelleyi* of Fernando Po and Mt. Cameroon, for example, is smaller than *N. s. bansoensis* of the Banso Mountains of Cameroon. This difference in the incidence of size increases in the mountain and in the lowland birds of Fernando Po might indicate that these increases are due to lower temperatures on the island in the lowlands only. Presumably the temperatures on the upper levels of Mt. Santa Isabel and of Mt. Cameroon would be about the same.

In those numerous cases in which size increases do not seem attributable to interspecific competition or to temperature effects it is likely that intraspecific competition has played a part. As emphasized by Simpson (1944, p. 86) the largest individuals of a species will, on the average, be more successful in obtaining mates, in warding off enemies, and in monopolizing food supplies. The interplay of such factors is very complex. The social structure of a species as reflected in the extent to which larger individuals (males) compete with smaller females for food may determine whether a shortage of food on an island will select for gigantism or dwarfism. Dwarfism seems to be more usual in mammals (Krumbiegel, 1943; Hooijer, 1947) and size increase and even gigantism seem to be so in birds. But the São Tomé ibis is a dwarf form, and Van Bemmelen and Hoogerwerf (1940, p. 471) attributed the diminutive size of the race of *Rallus philippensis* found on the barren islet of Goenoeng Api to the "influence of the extremely unfavourable circumstances." A few instances are known, as in Rennell Island, an outlier of the Solomon Islands, in which the birds are rather generally of small size (Mayr, 1931). In this case also, the environment seems to be less luxuriant than that of the islands inhabited by the races of the same species that are larger in size.

Krumbiegel suggested that the small size of most of the mammals of Fernando Po is due to inbreeding in small populations, but it is doubtful whether the numbers of many wild species are small enough for small-population genetic effects to be of importance, even assuming that they would, in a significant number of cases, lead to decreases in

TABLE 2
WING AND CULMEN IN THREE SPECIES OF *Cyanomitra*

Species	Sex	Wing	Culmen	Culmen:Wing Ratio	Wing ♀:Wing ♂ Ratio
<i>newtoni</i>	Female	49	14	.286	.925
<i>newtoni</i>	Male	53	15.5	.292	—
<i>harilaubii</i>	Female	61	18	.295	.938
<i>harilaubii</i>	Male	65	22	.338	—
<i>thomensis</i>	Female	83	29	.349	.883
<i>thomensis</i>	Male	94	40	.426	—

size. It is also possible that on islands with a luxuriant flora and many invertebrates but a low number of avian species, the few birds that are present have more rather than less food available than is the case on continents.

Animal husbandrymen know that metabolic efficiency as regards utilization of food increases as body size increases (Watson, 1950). Larger cows or horses, other things being equal, are more efficient than small ones. The same factor may select for size in wild animals, yet larger individuals do, after all, require more food, so again there are conflicting selective forces at work.

The above discussion will at least indicate the complexity of the problem of size change in insular forms. At present it is difficult to say whether or not extreme cases, as represented by the dodo (*Raphus*) or by the insular ratites, have the same causes as the slight average changes discernible in the avifauna of such an island as Fernando Po. The fact that the birds of the more highly isolated islands, São Tomé and Príncipe, show in several cases size changes that are much more pronounced than those present on Fernando Po, suggests that similar factors may be at work.¹

INCREASE IN SIZE OF BILL

Increase in size of the bill is even more prevalent in the avifauna of Fernando Po than is increase in general size. In almost

¹ The pituitary of giant forms, including some insular ones, is often of relatively great size (Edinger, 1942). This has been proposed as a cause of gigantism. The fact that gigantism occurs in so many unrelated groups suggests that the pituitary enlargement is a physiological result or accompaniment of increasing size, rather than its cause.

Rensch has recently (1950) pointed out that in groups of related species having a wide range in size, sexual size difference is usually greater in the larger species than in the smaller ones. *Cyanomitra thomensis* when compared with smaller related species is an excellent example of this (table 2). Although Rensch did not attempt to explain the reasons for this correlation, the fact that it often occurs in groups where allometric changes in the bill are pronounced, suggests that the two phenomena are related. Examples, in addition to *Cyanomitra*, are the shorebirds *Limnodromus* (Pitelka, 1950) and *Numenius*. Presumably a differential rate of growth is set up between males and females, and this tends to be carried over into phylogenetic changes in size, just as do allometric changes in the bill (see below). As Rensch pointed out, the increased sexual dimorphism in general size and in allometric characters in the larger species of such groups is often correlated with elaboration of courtship displays and, it may be suggested, with changes in feeding habits such as the acquisition of the creeper-like habit of searching for insects beneath bark in *Cyanomitra thomensis* as observed by Snow (1950).

one-fourth of the species of that island the bill is longer than in the mainland population. This includes most of those, mentioned above, in which the general size is larger, but also some, such as *Cuculus solitarius magnirostris*, *Ploceus brachypterus po*, and *Nigrita c. canicapilla*, in which no increase in general size is apparent by the somewhat rough standard available (wing length taken from

small samples). In *Nectarinia minulla* the wing length is greater on Fernando Po but the bill does not seem to be longer.

On Principe and São Tomé, also, many of the endemic forms are large billed. Examples are *Onychognathus f. fulgidus*, *Oriolus crassirostris*, *Ploceus grandis*, *Cyanomitra thomensis*, *Treron s.thomae* (see pls. 2-4).

That island birds are often large billed is well known. Murphy (1938) investigated this problem for the offshore islands of North America and found that of 27 endemic subspecies 21, or 78 per cent, have a larger bill than the related mainland race, and that of nine endemic insular species all have a relatively large bill. He concluded (p. 538): "For the present, such a problem bids fair to stump geneticists and 'environmentalists' alike."

There are several possible causes for relative increase in the size of the bill in insular birds; the problem is too complex to receive general consideration here. In *Cyanomitra thomensis*, a long bill seems to be due to positive allometry. The bill is relatively longer in the male than in the (smaller) female (table 2). Such allometry is most frequent in species having, to begin with, a long or decurved bill in which an ontogenetic growth pattern involving positive allometry is more or less inevitable (i.e., the bill is relatively short at the time the bird hatches). Growth patterns thus fixed tend to carry over into geographic or phylogenetic situations, so that as sexes, races, or species in the group become larger they have relatively longer bills. Some of the longer-billed shorebirds, such as the genera *Limosa* and *Numenius*, are examples.

It is possible that allometry may in some cases be responsible for increases in bill

length of insular birds even when no perceptible increase in general size is evident. The measurements of general size usually available are rather crude.

Races of insular birds in which the size is small but the bill is large are not unknown, and then other explanations are to be sought (it is scarcely permissible to suggest that in such cases negative allometry with decreasing size has produced larger appendages, though this does, as a matter of fact, seem to occur in mammals [MacArthur, 1949]).

Rensch (1939) has emphasized the principle of compensation, based on experimental work of Teissier indicating that the amount of "material" available to a growing animal at any moment is limited. If one organ increases it is at the expense of another. In a later paper (1940) comparing the size of the skeleton in temperate and tropical races of two birds, *Passer montianus* and *Parus ater*, Rensch found that the sternum is slightly smaller in the tropical races, while the bill is larger. He attributed this to "compensation," perhaps a rather far-fetched suggestion. If, however, one assumes that in tropical (and insular) birds, flight becomes less important and that at the same time there is some selection, however slight, for a larger bill, then it is possible that the compensation principle may be partly responsible for the observed increase in the size of the bill.

Such direct selection for increased bill size may be present. The general advantages of larger size in competition for food and mates may have special application to bill size (peck order). It is also possible that, in some cases, as body size increases, individuals with a relatively larger bill are favored, for the simple reason that they can eat more or faster.

SUMMARY

SYSTEMATIC NOTES on a large collection of birds made on three of the four islands in the Gulf of Guinea, West Africa (see map), by Mr. and Mrs. J. G. Correia are presented. Complete lists of the land and fresh-water birds of the four islands are given, and it is indicated which forms are endemic on the various islands, and which races (three in number) are described from the islands (in every case Fernando Po) as new in this paper. In addition, *Cyanomitra cyanolaema octaviae* and *Oriolus nigripennis alleni* are described as new from the mainland of West Africa. The following additional taxonomic changes are proposed: that the genera *Lampribus* and *Hagadashia* be united with *Bostrychia*; that *Creciscus* be united with *Crex*; that the following races, usually synonymized, be recognized: *Accipiter castanilius beniensis*, *Tyto alba poensis*, *Stizorhina fraseri rubicunda* from West Africa to separate it from the nominate race, which proves to be restricted to Fernando Po, *Chalcomitra rubescens stangerii* from Fernando Po, *Malimbus rubicollis rufovelatus* from Fernando Po, and *Lamprocolius splendidus lessoni* from Fernando Po. Two insular kingfishers, *thomensis* and *nais*, of the genus *Alcedo* (*Corythornis*) are made races of *leucogaster*, rather than of *cristatus*.

Fernando Po has an avifauna like that of West Africa with which it was once united, but less rich. Isolation has been great enough to produce endemic races in about 30 per cent of the resident species, but there is only one endemic species and no endemic genus. Principe and São Tomé are much more isolated and were never connected with the mainland, from which they differ ecologically to a considerable extent. A number of endemic species and a few endemic genera, as well as endemic races, are found on these two islands. Two of the genera, one genus from each island, are distinct enough to offer some difficulties as regards family assignment. Principe and São Tomé share a

number of endemic species, yet each has a number of characteristic endemics lacking on the other. Faunal relationships to Fernando Po are very slight, and each of the three islands has, to a large extent, derived its fauna independently from the mainland. No consistent trends in color character are apparent in the avifaunas of these islands. The birds of Fernando Po are often slightly larger and longer billed than those of West Africa. On Principe and São Tomé similar trends are noticeable and have progressed further, so that several of the endemic forms are very large for the groups in which they belong. But there are exceptions, for example, the dwarf ibis of São Tomé (*Bostrychia bocagei*). None of the environmental rules seems adequate to explain the trend towards larger size in such a large segment of the birds of the Gulf islands, and it is suggested that intraspecific rivalry for mates or for food under insular conditions (empty ecological niches, relative absence of predation) may have selected for increased size. In a few cases only, where double colonizations are involved, does interspecific competition appear to have been important in this respect. In such cases, one of a pair of competing species will, of course, be selected for smaller rather than larger size. Increase in size of the bill, a common phenomenon in these insular birds, is in some cases due to allometric correlation with general size. In other cases it may be due to direct selection for a larger bill, either for feeding or for gaining dominance over other individuals of the same species. "Compensation" may be involved.

The São Tomé giant sunbird, *Cyanomitra thomensis*, is shown to be an excellent example of several aspects of allometry and also of the increase in sexual dimorphism in size which, as Rensch has recently pointed out, often characterizes the larger species of a related group.

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