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## THE BIRDS OF NINDAM FOREST RESERVE, KAGORO, NIGERIA

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## INTRODUCTION

In the following account we use the vegetation classification of White (1983). In the Guinea-Congolia/Sudania regional transition zone of Nigeria lie several outliers of lowland rain forest adjacent to, and south of Jos Plateau. It is not known if they are relict patches of formerly more extensive forest, or have arisen purely from local geographical and climatological conditions (Jones 1963). Near Kagoro (09° 32'N, 08° 30'E) in Kaduna state are several such outliers, many of which are found in large forest reserves (Fig. 1). One of them, Nindam Forest Reserve (approx. 3000 ha) is easily accessible, and on a brief visit there in 1976 we encountered birds typical of the main forest block over 100 km to the south, e.g. Blue Plantain-eater Corythaecola cristata, Shrike Flycatcher Megabyas flammulata and Collared Sunbird Anthreptes collaris. We sensed that the Kagoro area, particularly Nindam, would be interesting to investigate ornithologically, and this paper reports our findings.

## STUDY AREA AND METHODS

Nindam Forest Reserve is characterized by a series of parallel, round-topped ridges and deep, V-shaped, forest-filled valleys containing ephemeral streams. The vegetation changes from rain forest to transitional forest and closing savanna on valley slopes, and then to savanna on the ridge-tops. Shifting cultivation has altered some of the valley bottoms, and cattle-grazing and burning have degraded the savanna along the ridges to some extent. Numerous saw-pits in the forest are indicative of past exploitation for timber. Presently, dead wood is removed for fuel but no other cutting is legally permitted. Local villagers burn the forest floor to kill fire-sensitive trees and then later remove the dead wood. This has allowed the spread within the forest of adventitious weeds and constitutes the major threat degrading Nindam Forest Reserve.

The flora of Nindam is imperfectly known, but some features are striking and worth mentioning here. Trees characteristic of lowland rain forest, such as Parinari kerstingii, Aubrevillea kerstingii, Blighia unijugata, Canarium schweinfurthii, Ficus varifolia, Napoleona imperialis and Myrianthus arboreus have been identified. Unlike the grass dominated savanna, the forest floor is covered with pteridophytes (mainly Selaginella) and members of the ginger family (Zingiberaceae). In more humid patches the trees and rocks are festooned with epiphytic orchids, mosses and ferns.

In addition to a rich avifauna, Nindam supports species of forest-inhabiting vertebrates which are north of their previously known geographical ranges in West Africa, e.g. the small gliding lizard Holaspis guentheri. Forest mammals such as Two-spotted Palm-civet Nandinia binotata and Mona Monkey Cercopithecus mona were occasionally observed or turned up in hunters' bags. The mouse Praomys jacksoni is the expected species in forest outliers but surprisingly at Nindam only the true high forest species Praomys tullbergi has been found. Many cave-dwelling bats, rare or previously unknown in Nigeria, have been found including Rhinolopus aethiops, Rhinolophus darlingi and Hipposideros ionesi. The tiny forest bat which inhabits weaver nests Kergulia smithii was also found.

The dominant geological feature of Kagoro is the Kagoro Hills, a westward extension of the Jos Plateau. These rocky hills rise abruptly to more than 1300 m, nearly 500 m above Kagoro town. Due to its proximity to the Jos Plateau, the Kagoro area receives more rainfall than other locations of similar latitude in Nigeria. Kafanchan (Fig. 1) has a mean annual rainfall of 1554 mm, whereas Minna 180 km due west receives

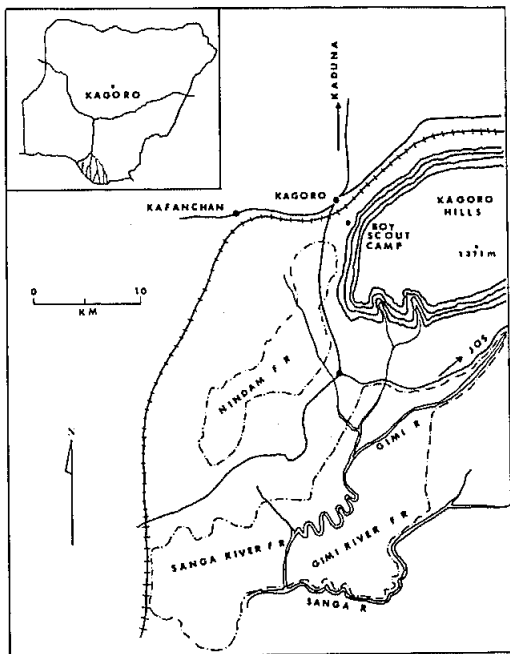


Figure 1 Study area at Kagoro and environs, Kaduna State, Nigeria.

1400 mm (Jones 1963). The higher reading at Kafanchan is due to orographic rainfall from southwesterly winds blowing up the Niger Valley and meeting the Plateau.

Nindam was first visited on 19 Dec 1976. On a second visit in Feb 1977 MEG discovered Purple-throated Cuckoo-Shrike Campephaga quiscalina there, the first record for Nigeria. Between Mar 1977 and May 1979 RES visited Nindam 12 times, covering all months except Jan, Oct and Dec. On 13 Sep 1977 he netted Red-capped Robin-chat Cossypha natalensis, another new species for Nigeria. Starting in Jun 1979 a concerted effort was made by all of us to make observations at Nindam at least once per month for two days. We generally confined our observational studies to a 400 ha area of the reserve bisected by the main Kaduna-Jos road. (In addition we made three visits to other reserve areas nearby, principally the Sanga River and Gimi River Reserves; a list of species seen there, additional to those recorded for Nindam and Kagoro given in Table 1, appears in Appendix 2).

When our study ended in Sep 1981 we had made a minimum of three visits to Nindam for each month of the year. For most visits we based ourselves at the National Boy Scout Training Camp near the foot of Kagoro Hills; at other times we camped by the forest edge. Nets were erected at standard locations in forest, and tended from dawn until 0930 h, and again from 1500 h until dusk. When not tending nets we hiked well-established trails, recording by sight and sound all species encountered. Due to the parallel orientation of valleys and ridges in the reserve, the trails we followed passed alternately through patches of rain forest and strips of savanna.

Netted birds were weighed, ringed with numbered metal or plastic rings, and measured (wing chord). We attempted to accumulate 120 net-hours of work in the forest, and 10 h of trail-hiking for each two-day visit.

## RESULTS

104 species were recorded in Nindam Forest Reserve, and an additional 83 species from the immediate vicinity of Kagoro (Appendix 1). We feel this list is incomplete due to the bias given towards field-work in Nindam. Our records of species outside the reserve were collected opportunistically and no systematic method was undertaken to quantify or qualify the status and abundance of species outside Nindam. This point is clearly illustrated by Appendix 1, where the occurrence of common and widespread resident savanna species is spottily documented (e.g. Bronze Mannikin Lonchura cucullata, Yellow White-eye Zosterops senegalensis). Other common species appear to have been overlooked completely, but no doubt occur at Kagoro, for instance Senegal Coucal Centropus senegalensis and Village Weaver Ploceus cucullatus.

About 20 km south of Kagoro lie the Gimi River and Sanga River Forest Reserves, larger in area than Nindam (Fig. 1). We visited these reserves three times during the dry season (Dec and Jan), and recorded birds not found at Nindam. Sanga and Gimi supported areas of mature savanna woodland and forest of a type intermediate between gallery and lowland

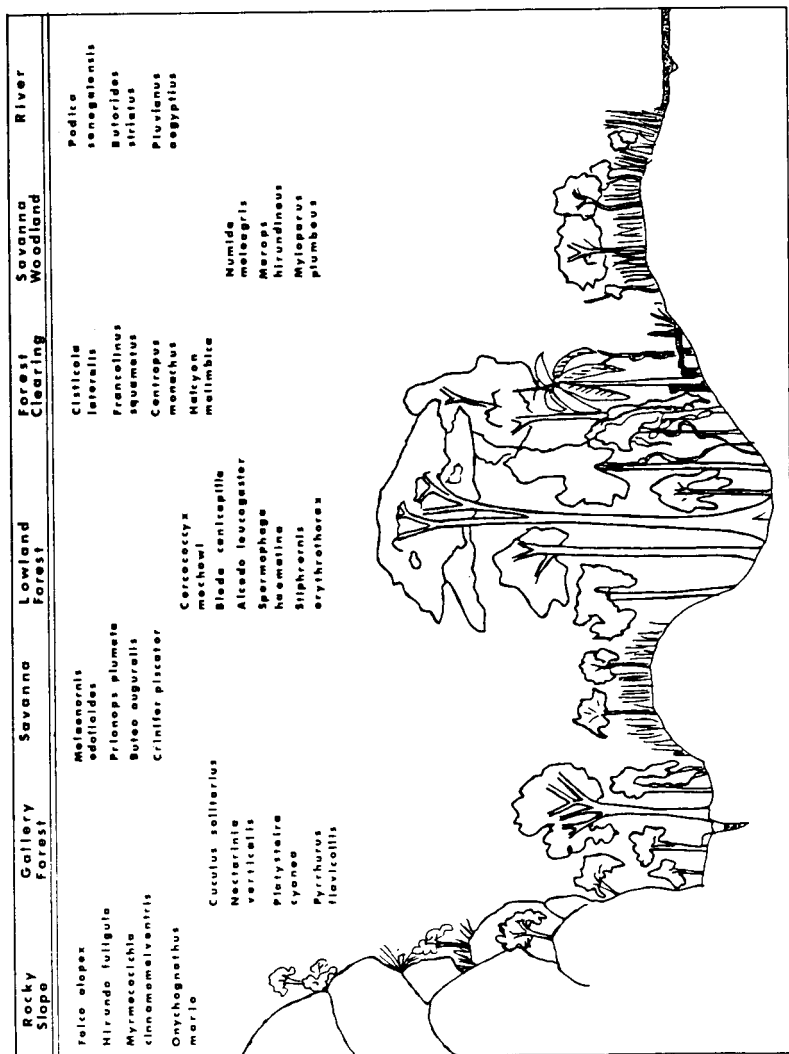


Figure 2 Hypothetical transect from Kagoro Hills (on left) to Sanga River Reserve, showing main habitats likely to be encountered. Under each habitat are species typical of those habitats.

forest. We saw many species recorded for Kagoro, but the presence of large, perennially-flowing rivers in the reserves contributed to a selection of aquatic and riparian species (Appendix 1). The most noteworthy observation was a pair of Brown-chested Lapwings *Vanellus superciliosus*, an intra-African migrant known to breed in grassy savannas of Nigeria (Elgood 1982).

Some birds seen at Nindam have wide ranges in Nigeria, such as Klaas Cuckoo Chrysococcyx klaas and Kurrichane Thrush Turdus pelios, but others, including four new species to Nigeria, have limited ranges. The four new species are Yellow-throated Cuckoo Chrysococcyx flavigularis, Bates' Swift Apus batesi, and the previously mentioned Purple-throated Cuckoo-Shrike and Red-capped Robin-Chat. Examples of rare and little known rain forest species of limited range in Nigeria and found at Nindam, are Spotted Honeyguide Indicator maculatus, Capuchin Babbler Phyllanthus atripennis and Little Grey Flycatcher Muscicapa epulata. Many records of forest birds at Nindam were obtained by mist-netting. Forest Robins Stiphrornis erythrothorax and Little Greenbul Andropadus virens were observed in comparatively small numbers in the forest undergrowth, yet they accounted for 37% of the total birds ringed (Appendix 3). The White-browed Forest-Flycatcher Fraseria ocreata, recorded only once, was caught in a net.

The diversity of birds recorded at Nindam is due to the juxtaposition of different habitats in a relatively small area. In a distance of 500 m it was possible to pass through mature savanna, undisturbed rain forest, timber-cleared areas, regenerating and secondary forest. We can illustrate this concept more clearly by considering a hypothetical transect through a much larger area to include all habitats between the Kagoro Hills and the larger rivers found in the Sanga and Gimi Reserves (Fig. 2).

#### DISCUSSION

Our study revealed many surprises, not least of which was the diversity of rain forest birds encountered at Nindam. About 40 species are regarded as stenotropic in their choice of rain forest habitat elsewhere in Nigeria, so the presence of species such as Blue-throated Roller Eurystomus gularis, Capuchin Babbler and Honeyguide Bulbul Baeopogon indicator in a relatively small and isolated area of forest in savanna is remarkable. Fifteen species recorded at Nindam were 300 km or more north of their previously known ranges in Nigeria. Adding to that the discovery of four new Nigerian species, the importance of the Kagoro area in general, and Nindam in particular, cannot be overstated.

Contained below is a list of essentially forest birds found at Kagoro with comments on status and habits.

West African Goshawk Accipiter toussenellii A bird of forest growth; sometimes netted as it attacked already netted birds.

Western Little Sparrowhawk Accipiter erythropus Recorded in March 1977, there is only one other record outside the derived savanna zone, at Yankari Game Reserve in the dry season.

Cuckoo Falcon Aviceda cuculoides The occurrence of Cuckoo Falcons at Kagoro during the dry season only is noteworthy since Elgood (1982) regards this species as a wet season visitor to savanna zones of northern Nigeria.

Red-footed Falcon Falco vespertinus Several were recorded on passage at Nindam in Mar/Apr, and a flock of 5,000+ birds was seen feeding on swarming termites near Kafanchan on 19 Apr 1980.

Scaly Francolin Francolinus squamatus Restricted to disturbed forest and clearings, especially near ridge-tops. Small flocks were often heard but infrequently seen during the wet season. This species is found further north at Anara Forest Reserve near Zaria (Gartshore 1982).

Pigmy Spotted Rail Sarothrura pulchra The piping call of the Pigmy Spotted Rail was a characteristic sound of Aframomum thickets in wet valley bottoms of large forest tracts. The species was rarely seen.

Tambourine Dove Turtur tympanistra Found along with T. abyssinica in the forest (ground level to 10 m). Of five doves caught, one was a recently-fledged juvenile (26 Oct 1980).

Giant Plantain-eater Corythaeola cristata Common resident of high forest canopy, occasionally extending into gallery forest around the base of Kagoro Hills.

Yellow-throated Cuckoo Chrysococcyx flavigularis Our observations on this species represent the first records for Nigeria. The characteristic song of this cuckoo was first heard on 8 Jul 1979, at the edge of a forest clearing, but it was not positively identified until 11 Nov. C. flavigularis generally occupied thick forest, but one was once seen flying through savanna between two forest patches. It called at all seasons and was probably resident.

Emerald Cuckoo Chrysococcyx cupreus A typical forest cuckoo which overshoots to as far north as Zaria on its northward migration at the beginning of the rains; common at Kagoro during the rainy season. Its status in the dry season at Kagoro is uncertain.

Dusky Long-tailed Cuckoo Cercococcyx mechowi Calls heard constantly between Apr and Dec. Although neither heard nor seen in the intervening months, their status as residents is in little doubt.

Thick-billed Cuckoo Pachycoccyx audeberti These cuckoos were seen regularly at Nindam. Given the thinly scattered records from gallery forest in other parts of Nigeria (Elgood 1982) this is of interest. A flock of five birds wheeled over the forest canopy on 17 Jun 1979.

African Wood-Owl Ciccaba woodfordii A rufous-phased adult was netted on 16 Sep 1981. It is present the whole year as indicated by calls.

Bates' Swift Apus batesi Four individuals were observed 27 Sep 1979 following a rainstorm flying low over forest. They circled for a few moments around the crown of a large forest tree before flying over the forest and out of sight. Two more were seen in the Kagoro Hills on 17 Feb 1980. They were identified by their small size, all black colouration, forked tail and rapid fluttering, twisting flight. (A second locality was obtained by MD and MEG at 1600 m on the Obudu Plateau in Sep 1980). This species is common in the highlands of Cameroon and is easily detected by its constant Swallow-like twittering. It is not

unexpected in Nigeria and may have been previously overlooked.

White-bellied Kingfisher Alcedo leucogaster Caught frequently during the study, mostly in nets set across forest streams. A juvenile with blackish bill was netted on 4 Nov 1980.

European Bee-eater Merops apiaster This nonforest bee-eater overwinters at Kagoro in small numbers. Nindam may prove to be its most northerly wintering location in Nigeria.

White-throated Bee-eater Merops albicollis Normally migrates from the sub-Saharan region where it breeds to the forest zone where it spends the dry season. The large numbers at Kagoro may represent the most northern most nonbreeding locality in Nigeria.

Blue-throated Roller Eurystomus gularis Regularly but rarely seen feeding or displaying over forest, and were presumed to be resident.

Allied Hornbill Tockus fasciatus Often seen in the 'middle belt' of Nigeria where forest outliers are common. It was common at Kagoro over the forest.

Piping Hornbill Bycanistes fistulator Another forest hornbill seen at Nindam as well as at the Boy Scout Camp.

Ceratogymna sp. Serle (1939) reported one of the Ceratogymna hornbills from the Kafanchan area, but none were recorded during the present study.

Black-and-White-Casqued Hornbill Bycanistes subcylindricus This large hornbill was rarely seen in the subcanopy of dense forest. A family party was observed 27 Sep 1979.

Double-toothed Barbet Lybius bidentatus These were uncommon residents of mid-level forest, and only one was netted.

Spotted Honeyguide Indicator maculatus This honeyguide was rarely observed although heard calling all year round, usually high in the forest canopy. Five calling posts were identified in the study area and one of these was used consistently through the five year period. Our observations represent the fourth record for Nigeria. It was netted in riverine woodland by Hall (1977) near Serti.

Willcocks' Honey-guide Indicator willcocksii Although encountered less frequently than I. maculatus, two were netted.

Prodotiscus sp. On 9 Sep 1979 a Prodotiscus honeyguide was observed flycatching at the edge of forest above a steep ravine, the only observation of this genus at Nindam.

Green-backed Woodpecker Campethera cailliautii A common species of mid-strata forest more frequently detected by call than by sight.

Buff-spotted Woodpecker Campethera nivosa Seen at mid-canopy level, C. nivosa was netted once and seen during the wet season only; it could be a wet season immigrant to Nindam although it is not known to be migratory in West Africa.



Purple-throated Cuckoo-Shrike Campephaga quiscalina Our observations of this species represent the first records for Nigeria but since it occurs in forested areas both east and west of Nigeria its presence in this country is not unexpected. This cuckoo-shrike occupies the canopies of trees above about 30 m height. It is best identified by the appearance of the female which is bright yellow beneath.

Slender-billed Greenbul Andropadus gracillirostris A canopy species which is often very difficult to detect. It was observed on only a few occasions. A bird of old-growth secondary forest, it is not expected at this northerly latitude.

Little Grey Greenbul Andropadus gracilis Found in the canopies of small trees overgrown by lianes. It is confined to the mid-strata and is apparently never netted near the ground.

Little Greenbul Andropadus virens A common species of forest and gallery forest at Kagoro. It was frequently netted.

Honeyguide Greenbul Baeopogon indicator A species of true forest, uncommon at Kagoro.

Grey-headed Bristle-Bill Bleda canicapilla This bristle-bill was frequently netted in the lower forest stratum in Nindam.

Nicator Nicator chloris Frequently heard among vines and tangles at Kagoro but never netted.

White-throated Greenbul Phyllastrephus albigularis This bulbul might be considered to behave as two "ecological species" in that males were distinctly larger-bodied and longer-billed than females (Fig. 3).

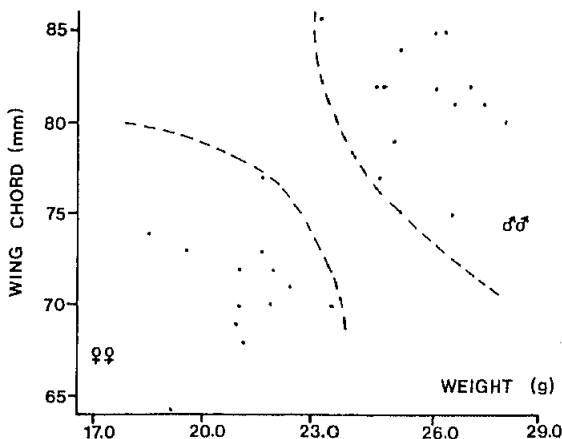


Figure 3 Body weight and wing length of male and female white-throated Greenbuls netted at Nindam.

Leaf-Love Pyrrhurus scandens A common bird of forest undergrowth at Kagoro; family parties were frequently netted.

Malaconotus sp. A shrike was heard regularly but was never seen. Once we had a brief view of a possible Sulfur-breasted Bushshrike Malaconotus sulfureopectus but we still cannot rule out the possibility of the presence at Nindam of such forest species as Many-coloured Bushshrike M. multicolor.

Red-capped Robin-Chat Cossypha natalensis Previously unrecorded in Nigeria; it proved to be a relatively common breeding resident of denser patches of forest. 24 individuals were ringed in all, including several birds in spotted juvenile plumage. On 15 June 1980 a nest containing three glossy, chocolate brown eggs in a small tree hollow about 1.5 m above ground in dense lowland forest was photographed. This represents the first recorded breeding of this bird north of the Congo. The single Cameroon specimen from Yaoundé is thought to be extralimital.

Snowy-crowned Robin-Chat Cossypha niveicapilla A regular dry-season visitor, arriving from drier savanna habitats to the north.

Forest Robin Stiphrornis erythrothorax Our most commonly netted bird; it is normally inconspicuous in the undergrowth.

Capuchin Babbler Phyllanthus atripennis The distribution of Capuchin Babbler appears to be disjunct; the only other known location for this species is within 80 km of Lagos (600 km southwest of Kagoro).

Puvel's Illadopsis Trichastoma puveli An uncommon resident of lowland rain forest the Kagoro records represent a substantial range extension to the north.

Brown Illadopsis Trichastoma fulvescens A bird of thickets in high forest this species was infrequently netted. It is possibly disjunct from populations occurring further to the south.

Green-backed Camaroptera Camaroptera chloronota This warbler was common in the forest undergrowth, and frequently netted.

Buff-throated Apalis Apalis rufogularis A species of the forest canopy; rarely caught (Appendix 2).

Whistling Cisticola Cisticola lateralis Permanent residents of the grassy/shrubby forest clearings, this species was occasionally netted.

White-browed Forest Flycatcher Fraseria cinerascens This flycatcher was recorded only once, a female with oviducal egg netted on 17 Feb 1980. It is not known to be migratory.

Little Grey Flycatcher Muscicapa epulata A bird of tall trees and dead limbs at the forest-savanna ecotone. Although not confirmed for Nigeria a bird fitting the description of this species and not easily assignable to any other Nigerian flycatcher was observed infrequently. Also recorded at Ayangba (feeding on a small skink which it had plucked from a tree trunk). Probably overlooked.

Shrike Flycatcher Megabyas flammulata These were uncommon inhabitants of the forest mid-storey. No birds were netted.

Collared Sunbird Anthreptes collaris An abundant bird of forest clearings, this is a species associated with derived savanna and high forest.

Olive Sunbird Nectarinia olivacea An abundant sunbird of the forest undergrowth, this species was frequently netted. It is also known from other outlier forests such as Kainji (Elgood 1982).

Variable Sunbird Nectarinia venusta Considered to be a wet season visitor to the savanna zone, this sunbird was a regular dry season visitor to disturbed habitats at Kagoro.

Buff-throated Sunbird Nectarinia adelberti This species was recorded once in February 1980 at the peak of tree flowering. It was seen at the same time as Superb Sunbird and both may be considered 'blossom nomads' which occasionally frequent more northerly latitudes in pursuit of nectar.

Superb Sunbird Nectarinia superba A pair seen February 1980 along with the above species as a 'blossom nomad' appearing at Nindam when forest trees are flowering.

Blue-bill Spermaphaga haematina This finch was found inside the forest and was an uncommon resident of the undergrowth.

Splendid Glossy Starlings Lamprotornis splendidus These starlings occurred in flocks at Nindam, but there was no evidence of breeding in the area.

Sudanian Woodland corresponds to Northern Guinea Savanna of Keay (1959) and Guinea-Congolia/Sudania regional transition zone corresponds to Southern Guinea Savanna and derived savanna. Mapping Unit 12 (Mosaic of Guinea-Congolian rain forest, Isoberlinia woodland and secondary grassland) describes well the situation found in the vicinity of Kagoro.

Several forest birds extend into the Sudanian Woodland in gallery or riverine forest. These include the Yellowbill, Guinea Touraco, Narina's Trogon to name a few. Other species such as Green-headed Sunbird, Violet Plantain-eater, Black-cap Babbler are confined to forest galleries in Sudanian Woodland (see Fry 1974) but probably occupy a more continuous woodland area in the Guinea-Congolia/Sudania regional transition zone though information on their distribution here is lacking. Forest outliers typical of the Guinea-Congolia/Sudania regional transition zone are not suitable habitats for these species and such outliers are therefore occupied by birds of essentially forest distribution. At Kagoro at least 52 forest birds are found with a nearly complete suite of forest bulbuls (see Fig. 4 and accounts above).

Part of this forest element at Kagoro is made up of species which are rare or previously unrecorded for Nigeria. These include Red-capped Robin-Chat, Capuchin Babbler, Spotted Honeyguide, Yellow-throated Cuckoo, Purple-throated Cuckoo-Shrike. These species are, for the most part,

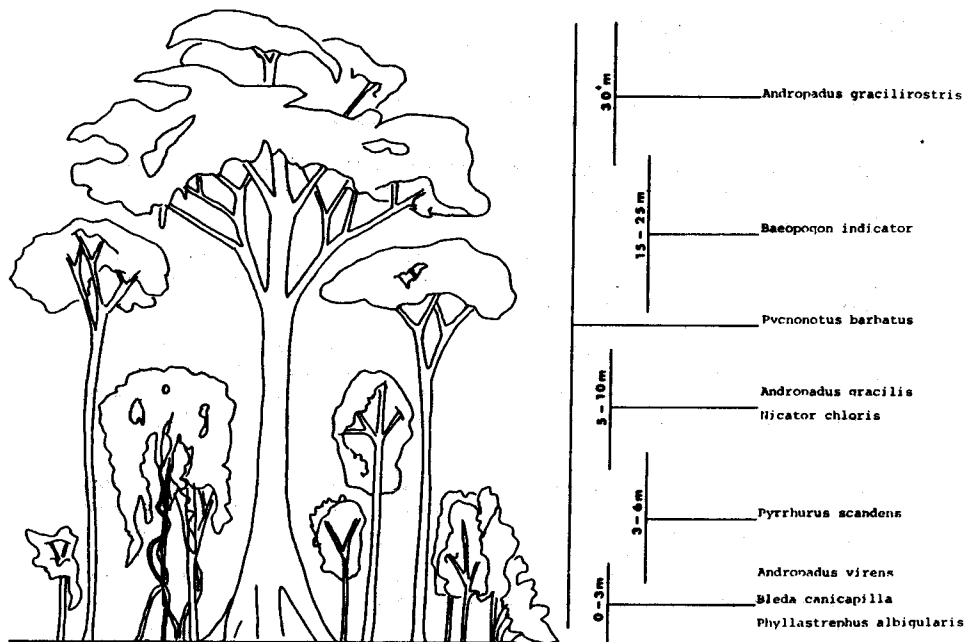


Figure 4 Vertical zonation of forest pycnonotids at Nindam.

sedentary and represent disjunct populations. Their presence may indicate that Kagoro is a refugium.

Evidence for African refugia is scarce particularly in or adjacent to the Congo Forest Block (Hamilton 1982). Hamilton (1982) concludes, from the available information, that Africa experienced much greater aridity between 21,000 and 12,000 B.P. Following the retreat of temperate glaciers Africa experienced a warmer, wetter climate. Recent palynological evidence suggests that forest cover in Africa began to increase at about the close of the last glaciation 12,000 years ago. In order to account for the present distribution of birds in West Africa, intact patches of forest sufficient to support viable populations of birds must have existed throughout the driest times. Some forest patches must exist which are sufficiently isolated that the species they contained found no opportunity to expand and occupy wider areas. Zones of species richness today are those which receive greater than average rainfall within the forested zone. These areas correspond to former refugia during glacial periods (Hamilton 1982). Two conditions characteristic of refugia are the presence of disjunct populations and a greater local rainfall (Hamilton 1982). The disjunct populations of birds are of two types at Kagoro: north-south and east-west. The east-west disjuncts are more interesting because they do not indicate a northward adventive re-population of forest patches on a seasonal basis. Purple-throated

Cuckoo-shrikes and Red-capped Robin-Chats are two such species. Although less information is available this pattern of east-west disjuncts may be similar for bats. The presence of migrants and nomads during the dry season at Kagoro such as White-throated Bee-eater, European Bee-eater, Snowy-crowned Robin-Chat, Cuckoo Falcon and Buff-throated Sunbird (birds which are normally found at this time much further south) may not have historical significance but indicates to us that Kagoro still possesses characteristics of true high forest.

#### CONSERVATION: A PLEA

Sadly, data are too few on 'middle belt' forest outliers to conclude that our records of rare birds for Kagoro are indeed unique. Surveys of many other forest outliers throughout the Guinea-Congolia/Sudania regional transition zone would yield important information about how species survive in and re-invade from isolated patches. Fortunately much of the middle belt zone of Nigeria remains intact due to a depopulation of that area towards urbanized zones or more favourable tsetse-free areas. Research in this area and protection of forest outliers should be encouraged as we have much to gain from their study.

Clearly from a scientific standpoint Kagoro area may have great significance as a possible refugium at the time of tropical aridity during temperate glacial maxima. Our impression is that the avifauna at Kagoro/Nindam may be unique in Nigeria, and we wish to plead a strong case for conserving this richly diverse and scenically beautiful area.

#### SUMMARY

The birds and other organisms were studied at Kagoro from 1976 to 1981. During this time about 40 species of stenotypic forest birds were documented including four species new to Nigeria. One species, the Red-capped Robin-Chat was discovered as a breeding bird at Kagoro but previously was not known north of the Congo. Speculation is given as to whether Kagoro represents a refugium.

#### ACKNOWLEDGEMENTS

We wish to express our thanks to all those who joined us on weekends at Kagoro making our visits there both more productive and more enjoyable.

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Dusky Long-tailed Cuckoo Cercococcyx mechowi, Nindam, Nigeria, 1981.

Photo: R.E. Sharland.

Appendix 1 Status, abundance and habitat of birds recorded at Kagoro

STATUS A = abundant, C = common, U = uncommon, R = rare, RE = permanent resident, DV = dry season visitor (Oct-Apr), WV = wet season visitor (May-Sept), VI(?) = visitor of undetermined seasonal status, PM = palaeartic migrant (either resident at Kagoro during its stay or transient through the area), and IM = intra-african migrant.

ABUNDANCE An indication of the number of birds likely to be encountered per two-day visit: 1 = 1 to 5 birds, 2 = 6 to 20 birds, 3 = 21-50 birds, 4 = 51 to 100 birds, 5 = 100 birds.

HABITAT (Main habitat in which each species recorded): F = forest, S = savanna, DF = disturbed forest (includes timber clearings, regrowth, cultivation and old village sites), DS = disturbed savanna (includes cultivation, man-made fadamas, human habitation), SG = gallery forest along streams and around Inselbergs in savanna, KH = rocky habitats on Kagoro Hills.

SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	STATUS	ABUNDANCE	HABITAT
<u>Ardeola ibis</u>	x	x											U DV	4	DS
* <u>Ciconia abdimii</u>				x									R IM	1	DF
* <u>Dendrocygna viduata</u>							x						R WV	1	DF
* <u>Gypohierax angolensis</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	1	F & S
* <u>Neophron monachus</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	3	DF & DS
* <u>Gyps bengalensis</u>								x					R VI	1	S
* <u>Circaetus cinerascens</u>					x		x	x				x	R RE?	1	F
<u>Circaetus cinereus</u>						x							R VI	1	S
* <u>Polyboroides radiatus</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	1	F & S
<u>Accipiter badius</u>	x	x											R DV	1	S & DS
* <u>Accipiter erythropus</u>				x									R VI	1	DF
* <u>Accipiter melanoleucus</u>	x	x						x					R VI	1	DF & DS
* <u>Accipiter toussenelii</u>	x	x		x	x	x		x	x	x	x		U RE	1	F
<u>Buteo auguralis</u>	x	x	x	x		x		x	x	x	x		U RE	1	S
* <u>Kaupifalco monogrammicus</u>	x	x	x	x	x	x	x	x	x	x	x		U RE	2	F & SG
<u>Aquila rapax</u>			x					x					R VI	1	S
<u>Aquila wahlbergi</u>										x			R VI	1	DS
* <u>Aviceda cuculoides</u>	x	x	x						x	x	x		U VI	1	F & S
<u>Elanus caeruleus</u>										x			R VI	1	DS
<u>Machaerhamphus alcinus</u>									x	x			R RE?	1	S
* <u>Milvus migrans</u>	x	x	x		x						x	x	C DV	3	DF & FS
<u>Pernis apivorus</u>												x	R PM	1	DS

SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	STATUS	ABUNDANCE	HABITAT
<u>Falco alopex</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	1	KH
<u>Falco biarmicus</u>	x	x											U DV	1	KH
* <u>Falco vespertinus</u>			x	x									R PM	5	F, S & DS
* <u>Francolinus squamatus</u>			x	x	x	x			x		x		U RE	2	DF
<u>Ptilopachus petrosus</u>			x									x	U RE?	2	KH
<u>Crex egregia</u>								x					R WV	1	DS
<u>Porphyrio alleni</u>								x					R WV	1	DS
* <u>Sarothrura pulchra</u>		x	x	x	x	x		x	x	x	x		U RE	1	F
<u>Streptopelia lugens</u>	x										x		R VI	1	KH
* <u>Streptopelia semitorquata</u>	x	x	x		x	x		x	x	x	x		U RE	2	F ? S
<u>Streptopelia senegalensis</u>			x	x	x	x		x	x	x	x		U RE	2	DS
<u>Streptopelia vinacea</u>	x	x	x	x						x	x	x	U DV	2	DS
* <u>Treron australis</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	3	F & SG
* <u>Turtur afer</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	3	F & SG
* <u>Turtur tymanistria</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	2	F
<u>Agapornis pullaria</u>			x								x		R VI	1	SG
* <u>Corythaeola cristata</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	2	F
<u>Crinifer piscator</u>		x	x					x					U RE?	1	S
* <u>Muscophaga violacea</u>				x		x	x		x		x		U RE	1	F & SG
* <u>Tauraco persa</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	3	F
* <u>Cercococcyx mechowi</u>	?	?	?	x	x	x	x	x	x	x	x	?	U RE	2	F
<u>Chrysococcyx caprius</u>					x	x	x	x					U WV	2	S
* <u>Chrysococcyx cupreus</u>	?	?	?	x	x	x	x	x	x	x	x	?	U RE	2	F
* <u>Chrysococcyx flavigularis</u>	x		x	x							x	x	R RE	1	F
* <u>Chrysococcyx klaas</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	2	F & S
* <u>Cuculus clamosus</u>		x	x	x	x	x						x	U WV?	1	F
<u>Cuculus solitarius</u>			x	x	x	x	x	x					U WV	1	SG
* <u>Pachycoccyx audeberti</u>	x		x	x	x				x	x	x		R RE	1	F & S
* <u>Ceuthmochares aureus</u>	x	x	x	x	x			x	x	x	x		U RE	1	F & SG
* <u>Centropus monachus</u>						x					x		R VI	1	DF
<u>Tyto alba</u>				x									R VI	1	DS
<u>Bubo africanus</u>	x	x	x					x		x	x		R RE	1	S
* <u>Ciccaba woodfordii</u>	x	x	x			x			x	x	x		U RE	1	F
<u>Caprimulgus tristigma</u>	x	x	x		x			x	x	x	x		U RE	2	KH
<u>Apus affinis</u>	x	x	x	x	x	x	x	x	x	x	x	x	A RE	5	S & DS
* <u>Apus apus</u>	x								x	x			U PM	4	Aerial
* <u>Apus batesi</u>			x	x	x					x			R VI	1	Aerial
* <u>Apus caffer</u>	x			x	x					x			U VI	2	Aerial
* <u>Cypsiurus parvus</u>	x	x	x	x					x	x	x	x	C DV	3	DF & DS
<u>Colius striatus</u>							x	x	x	x	x		U RE	2	S
* <u>Apaloderma narina</u>		x	x		x	x				x	x		U RE	1	F
* <u>Alcedo leucogaster</u>	x		x	x	x	x					x		U RE	1	F
<u>Ceyx picta</u>			x	x	x					x			U RE	1	S
<u>Halcyon leucocephala</u>	x	x	x	x							x	x	U DV	1	S
* <u>Halcyon malimbica</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	1	F & SG
* <u>Merops albicollis</u>	x	x	x	x	x	x			x	x	x		C DV	5	F & S
* <u>Merops apiaster</u>	x	x	x	x					x	x	x	x	U PM	4	F & S
<u>Merops hirundineus</u>	x		x							x	x	x	R VI	1	S
* <u>Coracias cyanogaster</u>						x							R VI	1	DF
* <u>Coracias naevia</u>												x	R VI	1	DF



SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	STATUS	ABUNDANCE	HABITAT
* <u>Eurystomus gularis</u>	x	x	x	x	x	x	x	x	x	x			U RE	1	F
* <u>Bycanistes fistulator</u>	x	x	x	x	x	x	x	x	x	x	x		C RE	2	F
* <u>Bycanistes subcylindricus</u>	x	x								x	x		R VI	1	F
* <u>Tockus fasciatus</u>	x	x	x	x	x	x	x	x	x	x	x		C RE	3	F
<u>Tockus nasutus</u>	x	x	x	x						x	x		U DV	3	S
* <u>Lybius bidentatus</u>	x		x	x	x		x	x	x	x	x		U RE	1	F
<u>Lybius dubius</u>												x	R VI?	1	S
<u>Lybius vieilloti</u>												x	R VI?	1	S
* <u>Pogoniulus bilineatus</u>	x	x	x	x	x	x	x	x	x	x	x		C RE	2	F
<u>Pogoniulus chrysoconus</u>			x	x							x		U VI	1	S
<u>Indicator indicator</u>	x	x	x								x		U DV	1	S
* <u>Indicator maculatus</u>	x	x	x	x	x	x	x	x	x	x	x		U RE	1	F
* <u>Indicator willcocksii</u>	x		x								x		R RE?	1	F
* <u>Prodotiscus sp.</u>										x			R VI	1	F
* <u>Campethera cailliautii</u>	x	x	x	x	x			x	x	x	x		U RE	1	F
* <u>Campethera nivosa</u>					x	x	x		x				U VI?	1	F
* <u>Dendropicos fuscesens</u>		x	x	x							x	x	U DV?	1	F & SG
<u>Dendropicos obsoletus</u>	x											x	R VI	1	S
<u>Mesopicos goertae</u>		x									x		R VI	1	S
<u>Delichon urbica</u>												x	R PM	1	S
<u>Hirundo abyssinica</u>		x	x	x	x	x	x						C WV	3	S
<u>Hirundo aethiopica</u>	x	x											U VI	1	S
<u>Hirundo daurica</u>	x	x											U VI	1	S
<u>Hirundo fuligula</u>	x	x	x	x	x	x	x	x	x	x	x		U HE	2	KH
<u>Hirundo semirufa</u>											x		R VI	2	S
<u>Hirundo senegalensis</u>												x	R VI	1	S
* <u>Psalidoprocne obscura</u>		x	x	x		x	x	x	x				C WV	2	DF & SG
* <u>Hirundo smithii</u>			x		x				x	x	x		U RE	1	DF
* <u>Anthus leucophrys</u>	X	X			x				x	x	x		U RE	1	DF & S
* <u>Campephaga phoenicea</u>	x		x	x						x	x	x	U DV?	1	F & S
* <u>Campephaga quiscalina</u>		x		x	x						x		R RE?	1	F
* <u>Andropadus gracilirostris</u>		x	x	x	x				x	x			R RE	1	F
* <u>Andropadus gracilis</u>	x		x	x	x					x			R RE	1	F
* <u>Andropadus virens</u>	x	x	x	x	x	x	x	x	x	x	x		C RE	3	F
* <u>Baeopogon indicator</u>	x	x	x	x	x	x	x	x	x	x	x		U RE	2	F
* <u>Bleda canicapilla</u>	x	x	x	x	x	x	x	x	x	x	x		U RE	2	F
* <u>Nicator chloris</u>						x	x	x	x	x	x		R HE	1	F
* <u>Phyllastrephus albigularis</u>	x	x	x	x	x	x	x	x	x	x	x		U HE	2	F
* <u>Pyrhrurus scandens</u>	x	x	x	x	x	x	x	x	x	x	x		U HE	2	F
<u>Pyrhrurus flavicollis</u>	x	x	x	x								x	U DV?	2	SG
* <u>Pycnonotus barbatus</u>	x	x	x	x	x	x	x	x	x	x	x		C RE	2	F & S
* <u>Prionops plumata</u>	x	x	x	x					x	x	x		U DV	2	S
* <u>Dryoscopus gambensis</u>	x	x	x	x	x	x	x	x	x	x	x		U RE	1	DF
<u>Laniarius ferrugineus</u>									x	x	x	x	U HE	1	SG
* <u>Malaconotus blanchoti</u>												x	R VI	1	DF & S
* <u>Tchagra senegala</u>												x	R VI	1	DF & S
<u>Tchagra minuta</u>												x	R VI	1	DS
<u>Cercomela familiaris</u>	x	x	x										U VI?	1	S
* <u>Cossypha natalensis</u>		x	x	x	x	x			x	x	x		U RE	1	F
* <u>Cossypha niveicapilla</u>	x	x	x							x	x		U DV	1	F
* <u>Cossypha poliontera</u>	x	x		x	x	x				x	x	x	U RE	1	F

SPECIES	J	F	M	A	M	J	J	A	S	O	N	D	STATUS	ABUNDANCE	HABITAT
<u>Myrmecocichla</u>	x	x	x	x		x				x	x	x	U RE	1	KH
<u>cinnamomeiventris</u>															
* <u>Stiphronis erythrothorax</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	2	F
* <u>Turdus pelios</u>		x	x		x					x	x	x	U VI	1	F & S
* <u>Phyllanthus atripennis</u>		x		x	x	x			x	x	x	x	U RE	1	F
* <u>Trichastoma fulvescens</u>	x		x	x	x		x		x		x	x	U RE	1	F
* <u>Trichastoma puvelli</u>	x	x		x					x		x	x	U RE	1	F
* <u>Apalis rufogularis</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	2	F
* <u>Camaroptera chloronota</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	2	F
<u>Camaroptera brachyura</u>													U VI	1	S
<u>Cisticola aberrans</u>				x	x	x	x	x		x		x	U RE	1	KH
<u>Cisticola juncidis</u>													R VI	1	DS
* <u>Cisticola lateralis</u>			x	x	x	x	x	x		x		x	U RE	1	DF
<u>Eremomela pusilla</u>													R VI?	1	S
<u>Hippolais pallida</u>													R VI?	1	S
<u>Phylloscopus trochilus</u>													R PM	1	S
<u>Phylloscopus sibilatrix</u>													R PM	1	S
<u>Sphenocercus mentalis</u>							x	x	x	x	x	x	U RE	1	S
* <u>Ficedula hypoleuca</u>	x	x	x										U PM	1	F & S
* <u>Muscicapa striata</u>													U PM	1	DF & S
* <u>Fraseria ocreata</u>													R VI?	1	F
<u>Melaenornis edolioides</u>						x		x	x		x		U RE	1	S
* <u>Muscicapa epulata</u>	x	x			x	x				x	x	x	U RE	1	F
* <u>Myioparus plumbeus</u>		x	x					x		x	x	x	U RE	1	DF & S
* <u>Megabyas flammulata</u>	x	x	x	x	x	x	x		x		x	x	U RE	1	F
<u>Platysteira cyanea</u>		x	x	x		x	x		x	x	x		U RE	1	SG
<u>Trochocercus longicauda</u>													R VI	1	SG
* <u>Terpsiphone viridis</u>	x		x					x	x	x	x	x	U RE	1	F & S
<u>Parus leucomelas</u>	x					x	x		x	x			U RE	1	S
* <u>Anthreptes collaris</u>	x	x	x	x	x	x	x	x	x	x	x	x	U RE	2	F
<u>Anthreptes longuemarei</u>													R VI	1	SG
* <u>Nectarinia adelberti</u>	x	x			x								R DV?	1	DF
* <u>Nectarinia coccinigaster</u>	x	x							x	x	x	x	U RE?	1	F & SG
* <u>Nectarinia olivacea</u>	x	x	x	x	x	x	x	x	x	x	x	x	C RE	2	F
<u>Nectarinia senegalensis</u>													R VI	1	S
* <u>Nectarinia superba</u>													R VI	1	F
* <u>Nectarinia venusta</u>	x	x	x										U DV	1	DF & S
<u>Nectarinia verticalis</u>		x	x	x					x	x	x	x	U RE	1	SG
<u>Zosterops senegalensis</u>													R VI?	1	S
<u>Emberiza tahapisi</u>	x	x	x	x									C DV	2	KH
<u>Serinus mozambicus</u>													R VI?	1	S
<u>Estrilda larvata</u>													R VI?	1	S
* <u>Estrilda melpoda</u>		x	x	x									U RE?	2	DF & S
<u>Estrilda troglodytes</u>													R VI?	1	S
<u>Lagonosticta rubricata</u>		x	x	x									U RE	1	S
<u>Lagonosticta rufopicta</u>													x R VI?	1	S
<u>Lagonosticta senegala</u>													x R VI?	1	S
<u>Lonchura cucullata</u>		x											R VI?	1	S
<u>Pytilia hypogrammica</u>													x R VI?	1	S
* <u>Spermophaga haematina</u>	x	x	x	x									U RE	1	F

SPECIES	J F M A M J J A S O N D												STATUS	ABUNDANCE	HABITAT	
	J	F	M	A	M	J	J	A	S	O	N	D				
<u>Petronia dentata</u>													x	R VI?	1	S
<u>Euplectes macrourus</u>			x													
<u>Euplectes hordeaceus</u>																
<u>Malimbus rubriceps</u>			x													
* <u>Ploceus nigricollis</u>		x	x	x		x										
<u>Quelea erythrops</u>																
<u>Vidua macroura</u>																
<u>Vidua funerea</u>																
* <u>Cinnyricinclus leucogaster</u>																
* <u>Lamprotornis splendidus</u>																
<u>Onychognathus morio</u>																
* <u>Oriolus auratus</u>																
* <u>Dicrurus ludwigii</u>																
<u>Corvus albus</u>																
<u>Ptilostomus afer</u>																

Appendix 2 Species recorded at Sanga River and Gimi River Forest Reserves which were not recorded at Kagoro.

<u>Butorides striatus</u>	Single bird fishing in Gimi River, 12 Jan 1980.
<u>Egretta garzetta</u>	Single bird, Gimi River, 12 Jan 1980.
<u>Scopus umbretta</u>	Pair roosting in tree, Gimi River, 12 Jan 1980.
<u>Butastur rufipennis</u>	6 attending bush fire, Sanga River, 3 Dec 1979.
<u>Francoelinus bicalcaratus</u>	6, Gimi River, 12 Jan 1980.
<u>Numida meleagris</u>	50+, Gimi River, 12 Jan 1980.
<u>Podica senegalensis</u>	Single bird, Sanga River, 22 Dec 1979.
<u>Pluvianus aegyptiacus</u>	3 resting on sandbar, Gimi River, 12 Jan 1980.
<u>Vanellus albiceps</u>	1, Gimi River, 12 Jan 1980.
<u>Vanellus senegallus</u>	2, Gimi River, 12 Jan 1980.
<u>Vanellus superciliosus</u>	3, Sanga River, 22 Dec 1979.
<u>Tringa hypoleucos</u>	1, Sanga River, 22 Dec 1979.
<u>Tringa ochropus</u>	3, Gimi River, 12 Jan 1980.
<u>Macrodipteryx longipennis</u>	2 males displaying, Gimi River, 12 Jan 1980.
<u>Dicrurus adsimilis</u>	Single bird, Sanga River, 22 Dec 1979.

Appendix 3 Ringing totals, weights and wing lengths of species netted in Nindam Forest Reserve.

SPECIES	No. ringed	Weight (g)		Wing (mm)	
		$\bar{x}$	N	$\bar{x}$	N
<u>Accipiter toussenelii</u>	1	230.0	1	201.0	1
<u>Kaupifalco monogrammicus</u>	1	-	-	-	-
<u>Turtur tympanistria</u>	5	79.7	5	110.0	3
<u>Merops albicollis</u>	2	19.2	2	-	-
<u>Alcedo leucogaster</u>	12	16.0	10	56.0	11
<u>Lybius bidentatus</u>	1	79.5	1	101.0	1
<u>Pogoniulus bilineatus</u>	2	12.3	1	55.0	1

<u>Indicator maculatus</u>	1	47.0	1	103.0	1
<u>Indicator willcocksi</u>	2	16.3	1	66.5	2
<u>Campethera nivosa</u>	1	42.2	1	90.0	1
<u>Andropadus virens</u>	109	24.0	93	76.5	108
<u>Bleda canicapilla</u>	34	45.9	28	99.7	28
<u>Phyllastrephus albigularis</u>	50	male 26.0	15	81.5	15
		female 21.9	13	71.0	13
<u>Pyrrhurus scandens</u>	7	44.3	6	99.5	6
<u>Pycnonotus barbatus</u>	1	-	-	-	-
<u>Cossypha natalensis</u>	24	35.5	15	89.9	15
<u>Cossypha niveicapilla</u>	13	37.9	9	99.1	10
<u>Cossypha polioptera</u>	20	20.5	16	75.7	16
<u>Stiphrornis erythrothorax</u>	88	16.0	48	64.1	48
<u>Turdus pelios</u>	6	65.6	6	115.2	6
<u>Phyllanthus atripennis</u>	7	87.4	5	119.3	6
<u>Trichastoma fulvescens</u>	16	27.5	11	74.6	13
<u>Trichastoma puveli</u>	12	45.0	5	86.2	6
<u>Apalis rufogularis</u>	2	-	-	-	-
<u>Cisticola lateralis</u>	2	21.6	2	61.0	1
<u>Cameroptera chloronota</u>	21	10.9	10	52.9	10
<u>Terpsiphone viridis</u>	4	14.4	2	80.0	3
<u>Anthreptes collaris</u>	2	8.9	1	52.0	1
<u>Nectarinia olivacea</u>	64	10.0	36	58.9	41
<u>Ploceus nigricollis</u>	1	-	-	-	-
<u>Spermophaga haematina</u>	17	23.4	9	68.9	8
<u>Dicrurus ludwigii</u>	6	29.3	6	104.0	6