West African Ornithological Society
Société d'Ornithologie de l'Ouest Africain

Join the WAOS and support the future availability of free pdfs on this website.

http://malimbus.free.fr/member.htm

If this link does not work, please copy it to your browser and try again.

If you want to print this pdf, we suggest you begin on the next page (2) to conserve paper.

Devenez membre de la SOOA et soutenez la disponibilité future des pdfs gratuits sur ce site.

http://malimbus.free.fr/adhesion.htm

Si ce lien ne fonctionne pas, veuillez le copier pour votre navigateur et réessayer.

Si vous souhaitez imprimer ce pdf, nous vous suggérons de commencer par la page suivante (2) pour économiser du papier.

February / février 2010

Bull. Nigerian
Orn.Soc.11(39)

ROAD TRANSECTS FOR LARGE-SCALE SURVEYING

by Antony Pettet

Line transects are commonly used in ecology for sampling population changes over short distances and sometimes over much longer ones. The 1969 Hovercraft Expedition to the rivers of West and Central Africa provided a good example of a transect on a semi-continental scale which could not have been done as quickly by any other means (Fry 1970). However, in this example the birds surveyed were more or less restricted to the transect itself by virtue of their ecological requirements; with other, more widely ranging birds, distribution is not so readily surveyed. For the more conspicuous and readily identifiable birds, road transects are useful and rapid and can provide information on broad distribution on a national scale. Most ornithologists of my acquaintance already list birds on a somewhat casual basis when motoring on long-distance tours; by systematising their observations they could produce more interesting and valuable information, especially if the same journeys were repeated during different seasons of the year.

The technique I developed whilst working on the vegetation of the Sudan Republic (1962-67) proved an effective means of studying changes in the distribution of a wide range of birds and was particularly useful in sorting out certain migrants in that country. For example, by repeating certain road (and rail) transects over several years I found that, following a particularly good rains, the dry season distributions of a number of wintering Palaearctic species (e.g. Isabelline Wheatear Oenanthe isabellina and Short-toed Lark Calandrella brachydactyla) and some breeding African species (e.g. Long-tailed Dove Oena capensis and Chestnut-winged Finch-Lark Eremopteryx leucotis) were to be found 100-200 miles north of their 'normal' positions. With the better road system in West Africa it is much easier to make these transects and well-documented examples could add very considerably to the existing knowledge of a number of species.

Technique

A driver and a recorder are required. The ideal situation is for another person to drive, either a professional (and reliable) driver or one's spouse, while one observes and records. However, few ornithologists are likely to have a professional driver and, in my experience, some wives are reluctant to do all the driving especially when accompanied by children. In these circumstances I have called off the birds while driving and my wife has recorded. Perhaps I should add parenthetically that not everyone will spend long hours note-taking with equanimity while the driver bird-watches - records in my own notebook are interlaced with some tart comments by my wife !

Although one can stop and identify birds with glasses, most will be identified while the car is moving and for this good eyesight is a real advantage. A good field knowledge of birds from a wide ecological range also makes a great difference to what can be accomplished and cuts down the number of birds seen but not identified.

Most observers may find it easier to record identifications at 5 or 10 mile (or km) intervals, for these have the virtue of reducing the volume of recording. Alternately, for really coarse mapping, recording birds at intervals marked off by a predetermined set of towns and larger villages could be used. Since I sometimes want to do quantitative analyses on the counts I prefer to record all birds at one mile (or km) intervals and undertake the extra recording this involves, rather than risk losing useful information. To reduce the amount of writing I often use log-sheets prepared for the journey concerned.

As well as birds, it is useful to log the more prominent physical features of the transect. The position of towns and larger villages should always be noted, not only as a convenient means of breaking the journey up into comprehensible fragments, but also because a largish group of conspicuous urban or semi-urban birds will be recorded mostly at those places, and it is useful to know their position on the transect. Other physical features of some consequence to bird distribution include rivers, forest-reserves, cultivations, inselbergs, water-holes and telephone lines adjacent to the road. Ephemeral features might also be noted where appropriate, prominent amongst these being : rising termites, grass fires and localised rain. Without this type of information on local environmental features it is sometimes difficult to explain odd aspects of the data which were self-evident at the time of recording but all too easily forgotten later when the counts are being written up.

The data can be summarised by tabulating the numbers of each species against convenient segments of the transect, divided on a mileage basis, or by reference to the towns and larger villages, or into convenient ecological units. Alternately it can be shown graphically on a pictorialised line transect of a sort I refer to as a 'viagraph'. This shows the presence/absence, or better the frequency, on a pictorialised road system. In its simplest form the road system is represented by a straight line (or lines) marked off at intervals by towns and major villages whose positions on the line(s) are regulated by their respective distances from one another. However, a greater visual effect can be obtained is the viagraph has the basic geographical outline of the original road transect and the

observations are plotted on this. An example of one such transect I made in Nigeria is described below and examples of viagraphs for several species are included.

Limitations of the method

It hardly needs stating that there are difficulties and drawbacks to this method of surveying, some of which are obvious and others less obvious.

Some may feel its main limitation to be the restriction to birds that can be seen from a road and are conspicuous enough to be readily identifiable from a car, automatically excluding a large number of interesting species. Experience shows that the number which can be surveyed in this way is larger than might be expected. It includes many birds of prey, vultures, rollers, hornbills, kingfishers, doves, bee-eaters, shrikes, some starlings, some swallows and martins, some swifts, some wheatears and larks, some egrets and storks; many of these birds are migrants whose movements are known in broad outline only and which would repay closer study. To give an example of the number of species that might be identified on a transect of some length : a journey from Ibadan to Malamfatori in mid-December yielded 71 different species and several others allocated to species-groups. From experience elsewhere I would not have ranked this as a particularly high total.

Conspicuousness and ready identifiability apart, the extent to which birds are recorded will depend on their density and the nature of their immediate habitat.

Birds have a greater chance of being recorded where their density is high and less chance in the peripheral parts of their range where density is lower or they are becoming increasingly restricted to particular facies of the environment. This density effect is almost certainly more important with the smaller or less conspicuous birds. Thus, although the centre of a species distribution will usually be clear from road transect data, inferences about the whole range have to be made with care.

In contrast with density effects, the habitat effect is not always clear. In general one can expect an inverse relationship between the amount of cover and the number of birds seen; the less the cover, the more the birds recorded, and vice versa. For this reason the records for open savanna are likely to be more representative and unambiguous than those for the well-developed woodland in the Guinea Savanna and Forest zones, and this applies to the species collectively as well as on an individual basis. Even in one vegetation zone it can sometimes be difficult to decide from transect data whether a bird is common in an open habitat because this is the preferred habitat or because it is more readily seen there.

Here general field experience of the bird in question can sometimes help resolve the problem. It is also conceivable for some species that the inverse relationship between cover and records will not hold. Some birds may prefer to perch where they can scan an open space, such as an open road, in which case road transect counts in each type of vegetation zone could be moderately representative of the population present.

The effect of the road itself should be remembered. More representative counts are undoubtedly obtained on quiet, narrow roads with dirt surfaces than the newer, larger, well-surfaced roads, even though they are not so comfortable to drive on. Much of the difference between the two types of road is attributable to the width and the distance of the vegetation and peripheral features such as telephone lines, as well as the greater volume of traffic these now carry.

Some features which form an ephemeral or artifical part of the environment also have the effect of concentrating some birds. The presence of Kites Milvus migrans, Grasshopper Buzzards Butastur rufipennis, bee-eaters, rollers, swallows and swifts at grass fires is well known; as also is the predilection for urban life by Kites, Pied Crows Corvus albus and Hooded Vultures Neophron monachus; and the attendance of cattle by Cattle Egrets Ardeola ibis; but less well known seem to be the 'telephone-line birds' which can be a prominent feature of the roads in the Sudan and Sahel Savannas. These include a number of birds of prey which prefer to perch on the rigid telegraph poles, swallows and bee-eaters that perch on the lines, shrikes which use the poles as observation posts. and wheatears which use the shade of the poles at mid-day. There may be other, less favourable associations which generally fog the overall picture to be derived from road transects and the user should be aware of the possibility. Where migrant species are studied by road transects repeated at different times of year, these habitats effects lose some of their significance compared with the large shifts in distribution, and can be overlooked.

Diurnal changes in bird behaviour can also effect the extent of recording. During the dry season many birds tend to remain in shade during the middle of the day although this is less marked in overcast conditions or during a period of harmattan dust. This period of inactivity has the effect of reducing the number recorded during the middle of the day unless it is a species which seeks the shade of telephone poles on the side of the road, in which case the number may be increased. In the Sudan Republic where I was able to do long east-west census runs in moderately uniform vegetation, numbers recorded during the period 1100-1500 hours tended to be a half or a third of the early morning or late afternoon counts per interval. If only a qualitative record is required this reduction in the number of birds recorded is of negligible consequence unless birds are present in low densities or there is a very strong change in behaviour, in which case there

tends to be a conspicuous gap over the mid-day period. Where quantitative estimates of the species are required this diurnal fluctuation in numbers can be troublesome, especially where the run is through an area of some ecological heterogeneity, but there are ways of overcoming the effect. The simplest is to avoid travelling over the period 1100-1500 hours, but this may not always be practical. My own solution, not always possible, has been to arrange the return journey to cover the same route at different times - stretches travelled over mid-day on the outward journey being travelled at other times on the return. Where this is not possible and quantitative estimates are important, the data can be adjusted by certain statistical techniques developed for this type of data. The analyses can be rather complicated when time effects are confounded by habitat changes, and the average ornithologist is apt to feel that the labour involved does not warrant such a step.

An example of the use of road transects in Nigeria

In December 1967 I visited Malamfatori on Lake Chad from Ibadan, leaving on 13th December and arriving back on 28th. At the time this journey was made the Maiduguri-Baga road was incomplete, so the transect was terminated at the road camp known as 'Mile 90'. The transect, Ibadan to Mile 90, totalled 1094 miles and traversed the main ecological zones represented in Nigeria, although the sections in the Forest zone and the Sahel Savanna were rather short and atypical. During the outward journey I logged birds over certain sections and on the return logged the remainder, with the exception that the Kano-Zaria section was covered during a period of exceptionally thick harmattan dust and no recording was done. The journey, identified by the towns and major villages, is shown in Fig. 1, together with the positions of the main vegetation zones recognised by Keay (1953).

Species showing interesting points of distribution are illustrated by viagraphs in Figs. 2 and 3. Where records were particularly numerous they have been graphed at 5 mile intervals (i.e. Kite, Pied Crow and Hooded Vulture in Fig. 2(a); Wheatear Oenanthe oenanthe and Anteater Chat Myrmecocichla aethiops in Fig. 2(e); Abyssinian Roller Coracias abyssinicus in Fig. 3(a)), otherwise they are graphed at 1-mile intervals. Differences in frequencies for the intervals adopted are shown by different symbols. To save space, species have been plotted below the line of the viagraph as well as above, but this normally is not to be recommended.

KITE Milvus migrans (Fig. 2(a); above line)
A predominantly urban bird usually seen at villages and towns and recorded throughout the transect. At the time of the transect the bird would have been on the verge of breeding and the population more or less static; transects made during other seasons would have shown a very different distribution. Rather infrequently recorded in the Sahel and the more northerly part of the Sudan Savanna (Potiskum-

Maiduguri and northwards) where the density of the human population is relatively low; increasingly recorded from Potiskum to Kano, presumably because of the denser human population. The low incidence in the Northern Guinea Savanna and part of the Southern Guinea Savanna is presumably also related to the lower density of the human population rather than being the effect of the greater vegetation cover. The curiously low incidence between Zaria and Kaduna may, however, have been due to the newness of the road and the lack of roadside settlements. The bird was more obvious in the region of Mokwa and Jebba, and southwards became a more constant feature of the transect, although in well-spaced, small numbers, and several times was noted in ones and twos at grass fires.

PIED CROW Corvus albus (Fig. 2(a); above line)
An urban bird but less often recorded on the transect than Kite or Hooded Vulture (below), whether because its habits make it less conspicuous from the point of view of a road transect, or whether there was a real difference in numbers, it is difficult to tell, although other observations incline me towards the latter explanation. Interestingly, it was more frequently recorded in the much cultivated areas of the southern Sudan Savanna (Potiskum-Kano) than elsewhere. From Zaria southwards it was barely recorded apart from the large roosting flock at Bida.

HOODED VULTURE Neophron monachus (Fig. 2(a); below line)
Although breeding at the time, many of the birds recorded were presumably non-breeding individuals. Distribution similar to that of the Kite, particularly in the north, but with some differences in the more southerly areas. There was a tendency for numbers seen at villages and towns to be higher than the Kite and it was more frequently observed in the Northern Guinea Savanna than the Kite. As with the Kite, numbers at Mokwa and Jebba were high, but south of the Niger records were fewer and the bird was practically unrecorded in the Derived Savanna. It was not seen at Fiditi; its absence from the Forest south of Fiditi is well known.

RED-BILLED HORNBILL Tockus erythrorhynchus (Fig. 2(b); above line)
Rarely seen compared with the Grey Hornbill (below) and records restricted to the Sahel and Sudan Savannas.

GREY HORNBILL Tockus nasutus (Fig. 2(b); below line)
Recorded from Sudan Savanna to Derived Savanna, usually in ones and twos. At the time the bird was either on the verge of breeding or had started, in contrast with the Red-billed Hornbill which would recently have finished. Interestingly the Grey Hornbill would seem to outnumber the Red-billed Hornbill in the Sudan Savanna, where it was more often seen in forest reserves than outside. The apparently lower density of the Grey Hornbill in the Northern and Southern Guinea Savanna zones was no doubt related to the obscuring effect of the vegetation.

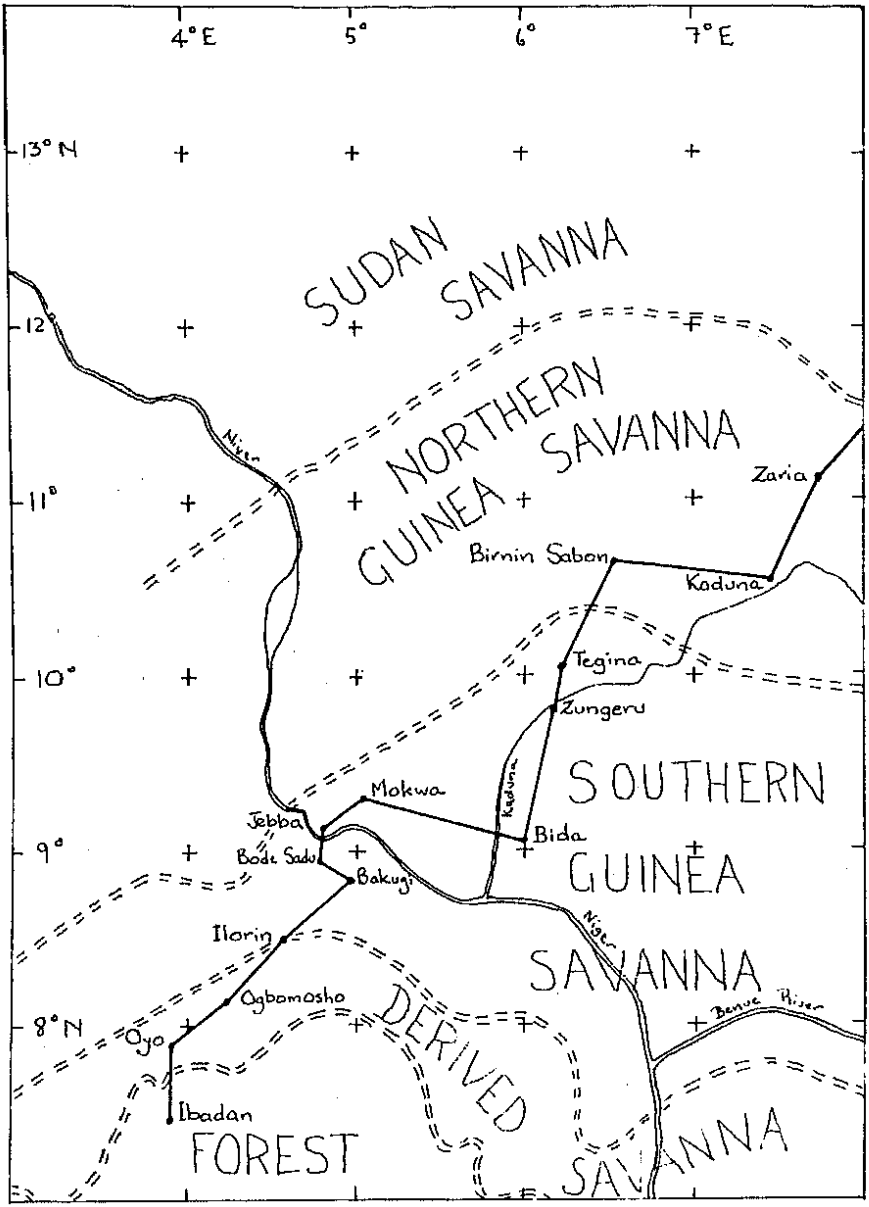
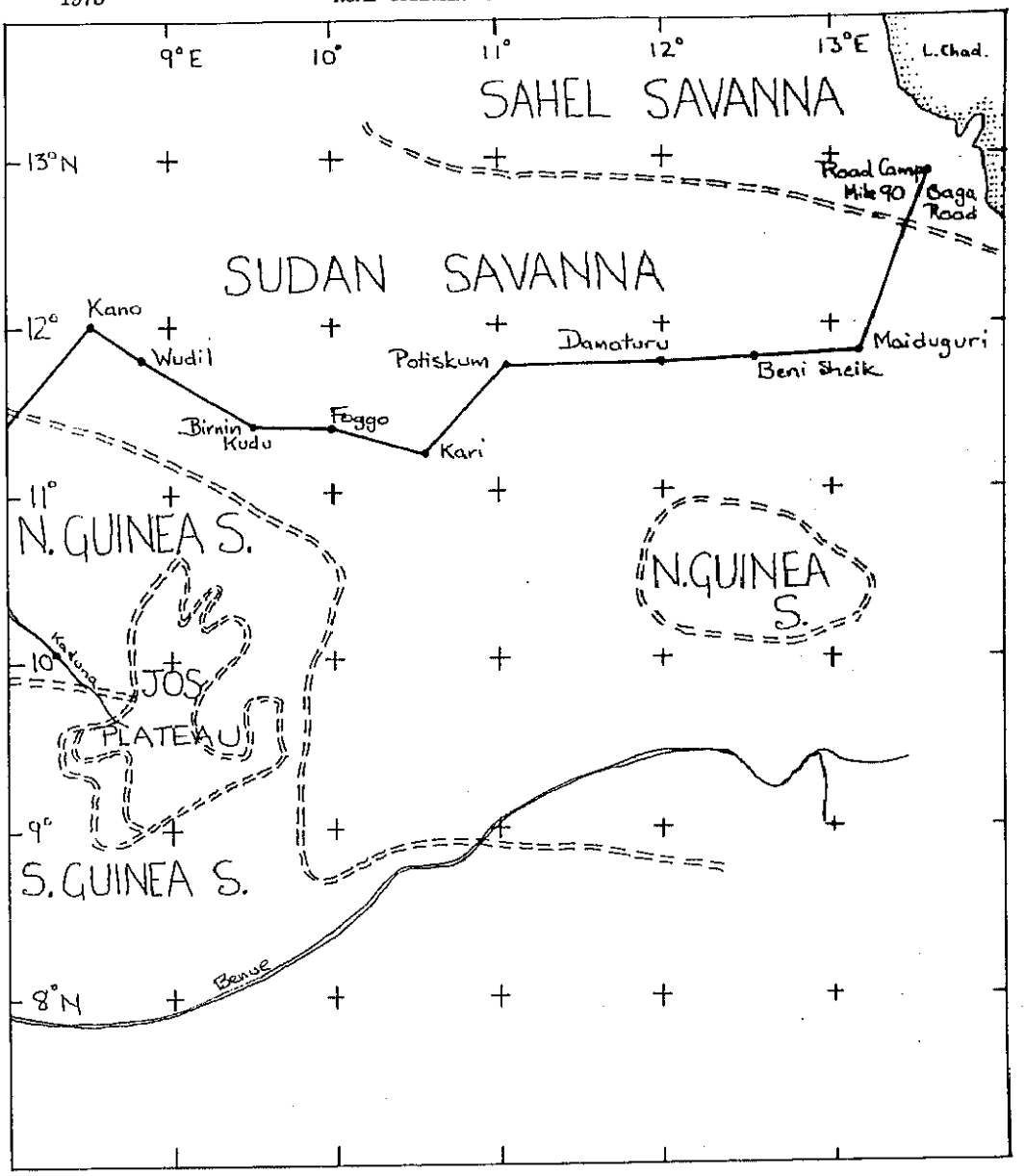


Figure 1 Map showing road transect of December 1967 and ecological zones of Keay (1953). Continued opposite.


9° E
10°
11°
12°
13° E
L. Chad.
SAHEL SAVANNA
13° N
Road Camp
Mile 90
Saga
Road
SUDAN SAVANNA
12°
Kano
Wudil
Potiskum
Damaturu
Maiduguri
Beni Sheik
Birnin
Kudu
Feggo
Kari
11°
N. GUINEA S.
N. GUINEA
S.
10°
JOS
PLATEAU
9°
S. GUINEA S.
8° N
Benue

CHANTING GOSHWAK Melierax metabates (Fig. 2(c); above line)
Apart from one unusual record in the Northern Guinea Savanna between Birnin Sabon and Tegina, records were confined to the Sahel and Sudan Savannas with the bird more numerous in the northern parts, i.e. Damaturu to Maiduguri and northwards. This bird is frequently seen perched on telephone poles.

BATELEUR Terathopius ecaudatus (Fig. 2(c); above line)
The records show an interesting picture. Most fall in the Potiskum-Maiduguri segment in the Sudan Savanna while two others were recorded in the Northern Guinea Savanna about Kaduna and Birnin Sabon. These two sets of records no doubt reflect the bird's requirement for large areas of lightly populated country with woodland.

GRASSHOPPER BUZZARD Butastur rufipennis (Fig. 2(c); above line)
A conspicuous bunching of records in the Southern Guinea Savanna with a single record in the Northern Guinea Savanna between Kaduna and Birnin Sabon suggest , perhaps, the centre of its winter range is in the Southern Guinea Savanna (cf. Elgood, Fry & Dowsett 1973, p.19). In view of its oft-quoted long-distance attraction to fire, it should be noted that none of the birds recorded was at fires; in fact, there was little evidence of grass burning throughout the transect until the Derived Savanna zone was reached.

KESTREL Falco tinnunculus (Fig. 2(c); below line)
Birds were widely scattered in the more open places in the Sahel and Sudan Savannas and were not logged south of Kano. Most of the birds seen were presumably Palaearctic migrants.

PARADISE WHYDAH Steganura orientalis (Fig. 2(d); above line)
Males of this species were in breeding plumage and readily identifiable in flight. Records were confined to the Sahel and Sudan Savannas where the birds tended to be more frequent in the better wooded areas towards the east, petering out westwards towards Kano in the more intensively cultivated areas. In contrast, the Pin-tailed Whydah Vidua macroura, which breeds earlier and is usually in non-breeding plumage at this time of year, was recorded twice, once in the Sudan Savanna and once in the Southern Guinea Savanna.

WOODCHAT Lanius senator (Fig. 2(d); below line)
Records were confined to the Sudan Savanna, from about Damaturu to Maiduguri, where it was a prominent bird of telephone lines where these occurred. The wintering range of this bird in Nigeria seems to be extensive (Elgood, Sharland & Ward 1966, p.111) and there seems no obvious reason why records for this species should have been bunched into such a limited stretch of the transect.

WHEATEAR Oenanthe oenanthe (Fig. 2(e); above line)
Records were confined to the Sudan Savanna and Sahel Savanna, from Kari to Maiduguri and northwards. One assumes that the lack of records between Kari and Kano reflects a generally lower density in these areas compared with further east. In the stretch, Potiskum-Maiduguri, where birds were most numerous, there was clear evidence of large-scale aggregation such as I have found in wintering Isabelline Wheatears in the Sudan Republic. This aggregation takes the form of loose groups of birds holding territories separated by distances up to several miles in extent where birds are scarce or absent, and seems to occur irrespective of obvious environmental heterogeneity. Four Spanish Wheatears O. hispanica were also recorded between Potiskum and Maiduguri but are not shown on the viagraph.

ANTEATER CHAT Myrmecocichla aethiops (Fig. 2(e); below line)
This had a similar distribution of records to the Wheatear but the bird showed a greater degree of aggregation, a feature that is fairly well known for this species.

CHESTNUT-BELLIED STARLING Spreo pulcher (Fig. 2(f); above line)
A not inconspicuous bird and one readily identified but, for a bird said to be characteristic of the Sudan Savanna (e.g. Fry 1973), the records show a curious distribution in the Sahel and Sudan Savannas: two flocks on the Maiduguri-Baga road and a cluster of records between Wudil and Kano with a complete absence in between.

LONG-TAILED STARLING Lamprotornis caudatus (Fig. 2(f); below line)
Far fewer records than expected and these thinly spread in the Sudan Savanna. In contrast, glossy starlings Lamprotornis spp. were recorded in small flocks in the Sahel and Sudan Savanna (? L. chalybaeus, L. chloropterus) and in ones and twos in the Northern and Southern Guinea Savanna (? L. purpureus).

ABYSSINIAN ROLLER Coracias abyssinica (Fig. 3(a); above line)
Although by December the dry season is well advanced and, in consequence, it might be assumed that this roller was at its breeding grounds at the time of the transect, it is at least three months before the bird starts breeding (April-May) and there are indications that the southward movement continues as late as December-January (Elgood, Fry & Dowsett 1973, p.35). Records were most numerous in the Sudan and Sahel Savanna with some thinning out between Potiskum and Kano. South of Zaria the bird was recorded less often and in small numbers in the Northern and Southern Guinea Savanna as far south as Bida. Beyond this the bird was presumably at very low density or absent. It is interesting to note that Elgood, Fry & Dowsett (loc. cit.) state that "in the dry season this roller is widespread in savanna, nowhere very common, and most records fall in the Southern Guinea zone". It may be that the records shown on the viagraph represent some stage prior to the final dry season distribution.

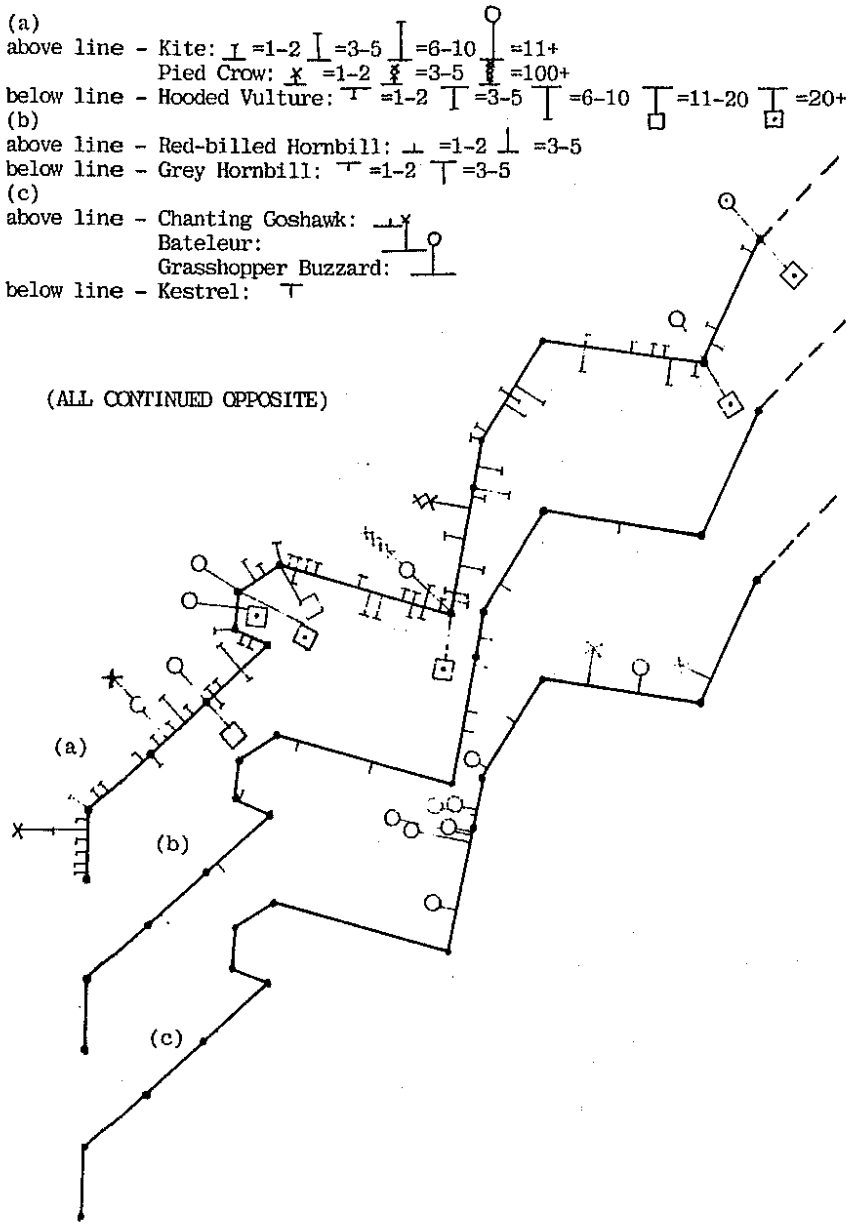
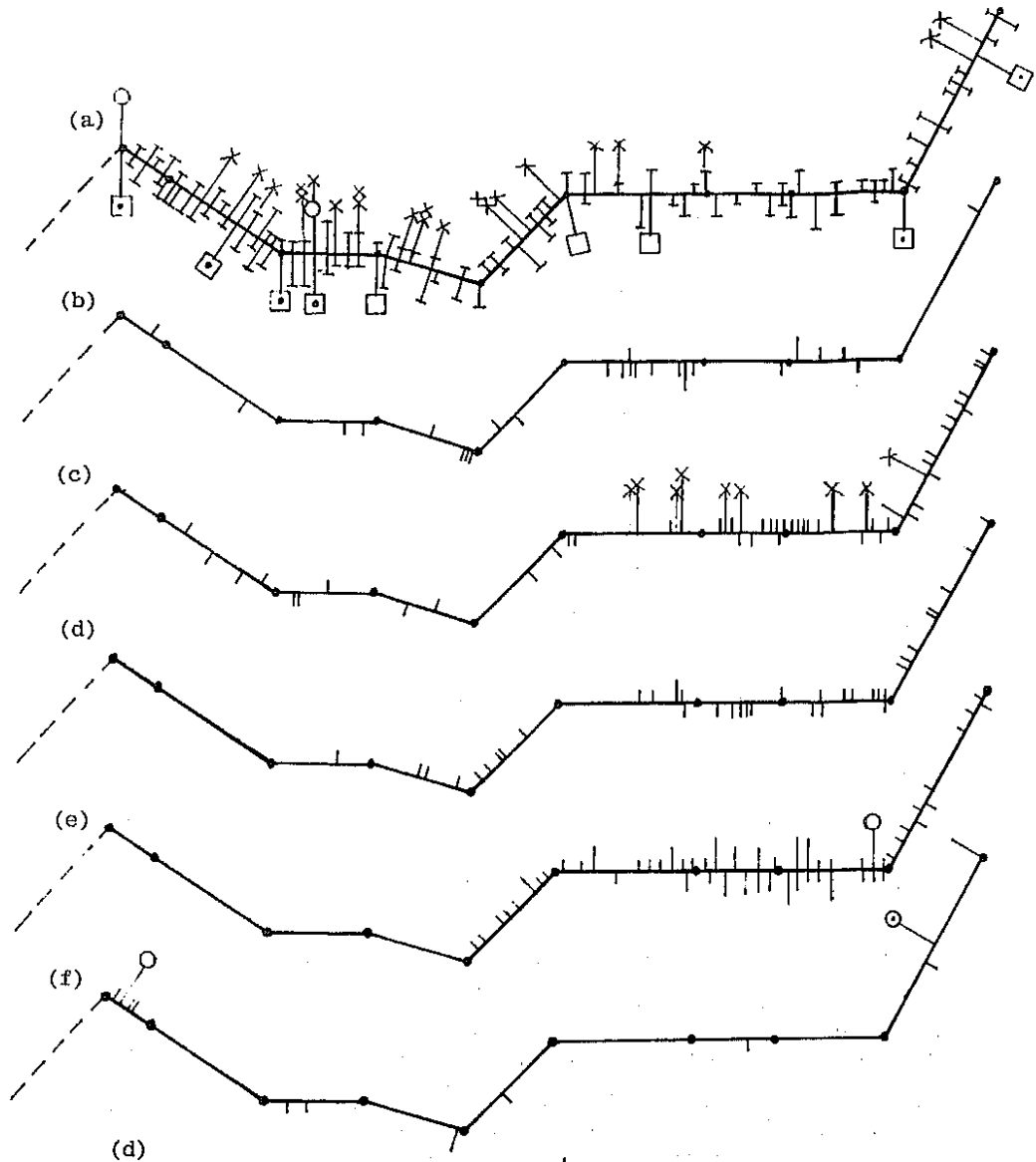


Figure 2 Viagraphs. Continued opposite.



(d)
above line - Paradise Whydah: ⊥ =1-2 ⊥ =3-5
below line - Woodchat Shrike: ⊤

(e)
above line - Wheatear: ⊥ =1-2 ⊥ =3-5 ⊥ =6-10 ⊥ =10+
below line - Anteater Chat: ⊤ =1-2 ⊤ =3-5 ⊤ =6-10

(f)
above line - Chestnut-bellied Starling: ⊥ =1-2 ⊥ =6-10 ⊥ =11-20
below line - Long-tailed Starling: ⊤ =1-2 ⊤ =3-5

RUFOUS-CROWNED ROLLER Coracias naevius (Fig. 3(a); below line)
Another African migrant, whose distribution and migrations are said to be similar to those of C. abyssinica (Elgood, Fry & Dowsett 1973, pp.35-36). A few isolated records in the Sudan, Northern Guinea and Southern Guinea Savanna - too few to add much to the migration picture.

CATTLE EGRET Ardeola ibis (Fig. 3(a); below line)
Recorded from Maiduguri to Jebba and at this time of year indicative of concentrations of cattle, either at watering places (Maiduguri), grazing on cultivation (Birnin Kudu to Wudil), or where migration tracks cross natural obstacles (Zungeru, Jebba).

LONG-TAILED DOVE Oena capensis (Fig. 3(b); above line)
Commonly recorded in the more northerly parts of the Sudan Savanna (Potiskum-Maiduguri) and Sahel Savanna, with very few records west of Potiskum. Most of the birds were presumably about to breed although the southwards movement to the breeding grounds may still have been continuing.

PINK-HEADED DOVE Streptopelia roseogrisea (Fig. 3(b); below line)
Readily identified by its pallor and white underwings when flying. A few records in the Sudan and Sahel Savannas.

LAUGHING DOVE Streptopelia senegalensis (Fig. 3(b); below line)
Included as an example of a bird that is common and widespread and has a strong urban-suburban component in its distribution. Recorded from the Sahel to the Southern Guinea Savanna with more records in the Sahel and Sudan Savanna. The thinning of records in the intensely cultivated countryside towards Kano may reflect the fact that this stretch was covered over the mid-day period when many birds may have been in the shade rather than on the roadside. The general paucity of records in the middle-belt, on the other hand, must surely reflect the generally lower human population and, possibly, the increased cover available since this was covered morning and late afternoon. However, transect data apart, I have a general subjective impression that this bird is commoner in the northern regions than in the middle-belt and south of the Niger.

ETHIOPIAN SWALLOW Hirundo aethiopica (Fig. 3(c); above line)
In contrast with the isolated records of the Sahel and Sudan Savanna, there were clusters of records about Zungeru and between Bida and Mokwa. The birds in the Sudan Savanna were present at villages; the clusters about Zungeru were presumably present because of the proximity of the River Kaduna, as might be true for part of the records on the Bida-Mokwa stretch although, as in the north, the birds here were also associated with villages. There were large numbers of swallows over the Niger at Jebba bridge which probably included the Ethiopian Swallow, but these have been omitted from the viagraph as we were discouraged by the soldiery on the bridge from stopping and sorting the birds out. The sole record for the Forest Zone is of a flock of birds at Fiditi. Elgood, Fry & Dowsett (1973, p. 379) state that available data suggest that this

species is sedentary and non-migratory. My own data at Zaria (1969-73) suggest a depletion of the resident population during the dry season, presumably because of a shift southwards to more permanent waters, and the transect data are consistent with this. The only other swallows identified on the transect were nine Red-rumped Swallows H. daurica in the Bida-Mokwa section and two Mosque Swallows H. senegalensis near Zungeru. Away from the rivers there were very few swallows, identified or unidentified, and the impression was of a general absence away from permanent water.

SAND MARTIN Riparia riparia (Fig. 3(c); below line)
My only records were of a few birds near the northern end of the Maiduguri-Mile 90 section. The species was thinly distributed over a wide area of dry country around Lake Chad and these records presumably represent the southerly edge of this.

PALM SWIFT Cypsiurus parvus (Fig. 3(c); below line)
Inserted to demonstrate the paucity of records on the transect. As might be expected small groups were usually associated with settlements. The bird was sparsely distribued from the Sudan to the Southern Guinea Savanna and was less conspicuous than in the wet season. Elgood, Fry & Dowsett (1973, pp. 34-35) infer the species to be sedentary, but the bird is a part migrant in the northern part of its range at least in the Sudan Republic, and might be such in Nigeria. The Little Swift Apus affinis was recorded once only, at a small village half way between Bida and Mokwa. Although Elgood, Fry & Dowsett (loc. cit.) treat this as a sedentary species, the bird, though present, is decidedly inconspicuous during the dry season.

LITTLE BEE-EATER Merops pusillus (Fig. 3(d); above line)
Records were confined to the Sudan Savanna between Potiskum and Maiduguri where, with the Little Green Bee-eater (below), it was conspicuous on telephone lines. Why both species should have been recorded in such numbers on this stretch of the transect and not elsewhere is not obvious. The species is more often associated with rivers and marshes in the dry season, but it moves to drier sites when breeding at the beginning of the rains. I have, however, seen it in the Sudan Republic in situations similar to the above during the dry season.

STRIPED KINGFISHER Halcyon chelicuti (Fig. 3(d); above line)
Recorded only between Damaturu and Maiduguri although said to be common in the Sudan and Sahel Savanna; on telephone lines.

LITTLE GREEN BEE-EATER Merops orientalis Fig. 3(d); below line)
Records were confined to the Damaturu-Maiduguri section as mentioned above. The Carmine Bee-eater M. nubicus was infrequently recorded, mostly singletons, at Damaturu, between Kari and Birnin Kudu, and in the Tegina-Bida-Mokwa section. These have not been graphed on the viagraph.

(a)
above line - Abyssinian Roller: =1-2 =3-5 =6-10
below line - Rufous-crowned Roller:
Cattle Egret: =1-2 =3-5 =6-10 =10+
(b)
above line - Long-tailed Dove: =1-2 =3-5
below line - Pink-headed Dove:
Laughing Dove:
(c)
above line - Ethiopian Swallow: =1-2 =3-5 =6-10 =11-20 =20+
below line - Sand Martin: =1-2 =3-5
Palm Swift: =1-2 =3-5 =6-10 =10+

(ALL CONTINUED OPPOSITE)

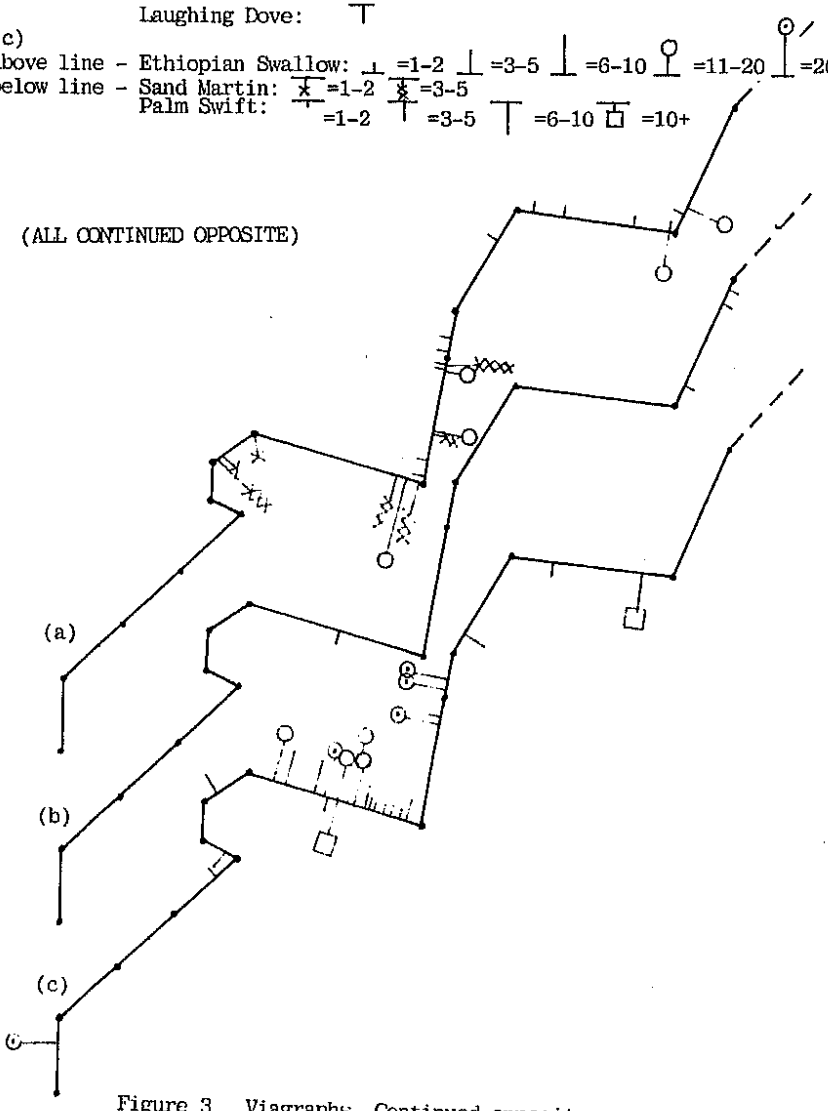
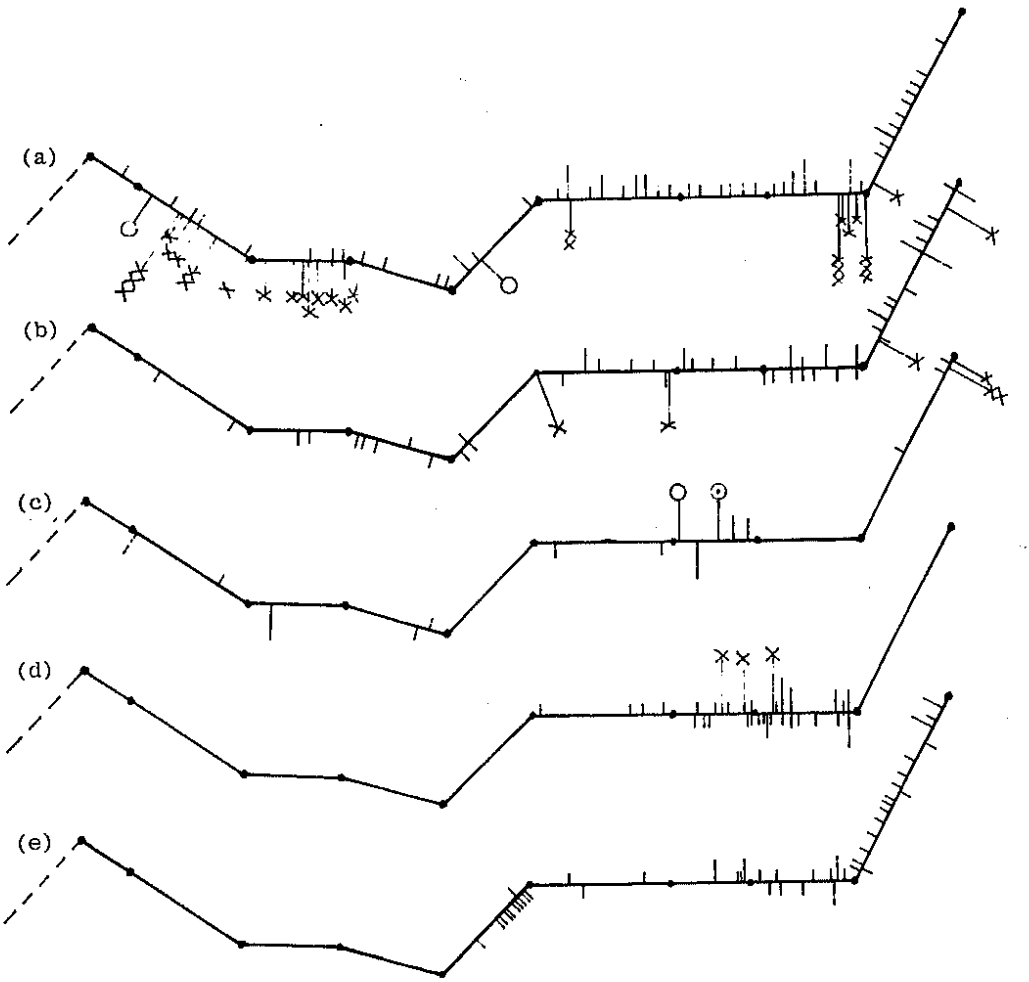


Figure 3 Viagraphs. Continued opposite.



(d)
above line - Little Bee-eater: ⊥ =1-2 ⊥ =3-5 ⊥ =6-10
Striped Kingfisher: ⊥
below line - Little Green Bee-eater: ⊤ =1-2 ⊤ =3-5 ⊤ =6-10
(e)
above line - Chestnut-backed Finch-Lark: ⊥ =1-2 ⊥ =3-5
below line - Crested Lark: ⊤ =1-2 ⊤ =3-5

CHESTNUT-BACKED FINCH-LARK Eremopteryx leucotis (Fig. 3(e);above line)
Practically all records were between Potiskum and Mile 90 with no records for the Kari-Kano section where it might have been expected. A migrant south to the Northern Guinea Savanna, but the full southerly extension of this species may not have occurred until after the time of the transect.

CRESTED LARK Galerida cristata (Fig. 3(e); below line)
A resident bird whose records complement those of the finch-lark, another ground-feeding bird. The section, Potiskum to Kari, was logged during the first few hours of daylight and the tight cluster of records on this stretch suggests that the Crested Lark is more likely to be seen on the roadside then than later; this may have some bearing on the apparent absence of the finch-lark over the same road.

References

Elgood, J.H.,Fry, C.H. & Dowsett, R.J. (1973) African migrants in Nigeria. Ibis 115: 1-45, 375-409

Elgood, J.H.,Sharland, R.E. & Ward, P. (1966) Palaearctic migrants in Nigeria. Ibis 108: 84-116

Fry, C.H. (1970) Bird distribution on West/Central African great rivers at high water. Bull. Nigerian Orn. Soc. 7 (25/26): 6-23

Fry, C.H. (1973) Avian indicators of increasing environmental aridity at Zaria. Savanna 2: 126-128

Keay, R.W.J. (1953) An Outline of Nigerian Vegetation. Government Printer, Lagos, Nigeria. Pp. 1-55

A. Pettet, 23 Cole Park Road, Twickenham, Middlesex TW1 1HP, U.K.