Happold DCD. 1987. Introduction. In:Happold DCD, editor. The Mammals of Nigeria. Oxford: Oxford University Press; p 1-9.

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Abstract: In this book about the mammals of Nigeria, the cheetah is mentioned several times. In the species description, the cheetah is considered scarce or maybe extinct in Nigeria. Its distribution has always been sparse and uncommon in West Africa compared to East Africa, but its numbers have strongly decreased during these last years. Although, it is considered almost extinct in Nigeria in the 50s, it survives in the Fauna Reserve of Yankari and in localities near Cameroon border. They are present but scarce in several National Parks in the northern of Cameroon near the eastern border of Nigeria, in the park of W Niger and Benin. In Nigeria, it is only present in the Sudanian and Sahelian savannah, but in very limited number. A Nigeria distribution map of the species is provided with only three observations.
The author updates his cheetah presence data in the West Africa countries. 14 years after his first list, the cheetah status has worsened. The species is always present in Senegal, Togo, Benin, Nigeria, Cameroon, Mauritania, Mali, Upper Volta and Niger. It is absent in Gambia, Sierra Leone and Liberia and his presence is suspected by local authorities in Guinea Bissau, Guinea, Ivory Coast and Ghana.

Dans ce livre sur les mammifères du Nigeria, le guépard est mentionné à plusieurs reprises. Dans la description de l'espèce, le guépard est déclaré rare voire éteint au Nigeria. Sa distribution a toujours été éparse et rare en Afrique de l'Ouest par rapport à l'Afrique de l'Est, mais ses effectifs ont fortement diminué au cours de ses dernières années. Bien qu'il soit considéré comme quasiment éteint au Nigeria dans les années 1950, ils survivent dans la Réserve de Faune de Yankari et dans des localités proche de la frontière du Cameroun. Ils sont présents mais rares dans plusieurs parcs nationaux au nord du Cameroun près de la frontière est du Nigeria et dans le parc du W du Niger et du Bénin. Au Nigeria, il est uniquement présent dans la savane soudanienne et sahélienne, mais en nombre très limité. Une carte de distribution de l'espèce au Nigeria est fournie avec seulement 3 observations.
Il réactualise ses données de présence du guépard dans les pays d'Afrique de l'Ouest. 14 ans après sa première liste, la situation du guépard s'est aggravée. Il est toujours présent au Sénégal, au Togo, au Bénin, au Nigeria, au Cameroun, en Mauritanie, au Mali, en Haute Volta et au Niger. Il est toujours absent de la Gambie, de la Sierra Léone et du Libéria et sa présence est suspectée par les autorités locales en Guinée Bissau, en Guinée, en Côte d'Ivoire et au Ghana.

THE MAMMALS OF NIGERIA

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Line Drawings by
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Chapter 1 · Introduction

The environment of Nigeria

CLIMATE

The most obvious feature of the environment in Nigeria is the gradual change from areas of high annual rainfall and rainforests in the south to areas of low annual rainfall and arid savannas in the north. Temperature and rainfall patterns at selected localities from south to north are shown in Fig. 1.1 and Table 1.1. In the extreme south, the temperatures are typical of those of many regions within the moist tropics. The mean monthly temperatures remain fairly even throughout the year, and the range of temperatures is small. At Lagos (Table 1.1), an example of the rainforest zone, the mean monthly minimum temperature is 22.1 °C, the mean monthly maximum temperature is 30.2 °C, and the range is only 8.2 °C. There are, of course, differences between months: in the 'dry season' (December–February), the range between maximum and minimum is usually 10 °C, but in the wet season it may be as little as 5 °C (Fig 1.1). The annual rainfall is nearly 1600 mm (63 ins) in the rainforest zone near Lagos and as high as 4000 mm (157 ins) near Calabar. The number of rainy days is closely related to the annual rainfall; there are about 125 days of rain each year near Lagos and about 200 days of rain each year near Calabar. Rain does not fall evenly throughout the

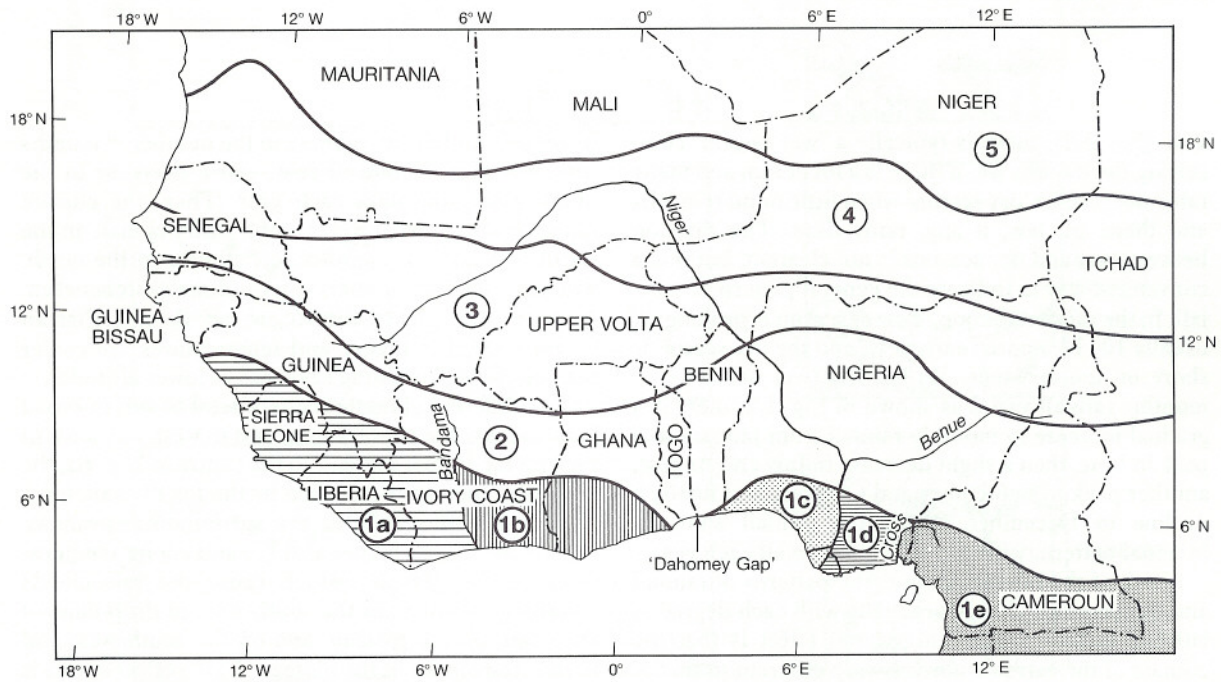


Fig. 1.1. Vegetation map of West Africa. The rainforest zone (1) is separated into five rainforest 'blocks': (1a) Liberian, (1b) Ghanaian, (1c) Western Nigerian, (1d) Eastern Nigerian, and (1e) Gabon. There is a break in the rainforest zone at the 'Dahomey Gap' where Guinea savanna reaches the coast. North of the rainforest zone are the Guinea savanna zone (2), the Sudan savanna zone (3), and the Sahel savanna zone (4). The southern limit of the Sahara desert (5) merges with the Sahel savanna. In West Africa, the vegetation zones run almost parallel along the lines of latitude.

Table 1.1. Characteristics of the vegetation zones of Nigeria

Vegetation zone*	Annual temperature (°C)				Rainfall			Vegetation		
	Mean	Mean Max.	Mean Min.	Mean Range	Mean annual (mm)	No. of months less than 25 mm/mo.	Mean no. days rain per year	Mean height (m)	Productivity†	
Sahel savanna 36 000 (4%) Maiduguri	27	35	19	16	659	7	~50	3	84	
Sudan savanna 309 000 (34%) Sokoto	28.4	36	21	15	689	7	58	4	108	
Northern Guinea savanna 173 000 (19%) Yelwa	27.6	34.3	20.8	13.5	1068	4	80	11	172	180
Southern Guinea savanna 191 000 (21%) Mokwa	27.4	33.6	21.0	12.6	1098	5	84	14	189	
Derived savanna 109 000 (12%) Ilorin	26.5	32.4	20.7	11.7	1285	3	109	17	236	
Rainforest 91 000 (10%) Lagos	26.2	30.2	22.1	8.1	1596	1	125	50	406	

Temperature and rainfall data from Meteorological Division, Federal Ministry of Agricultural and Natural Resources, Lagos; maps published by Federal Survey Department of Nigeria; and Griffiths (1972).

*Beneath the vegetation zone the area (km^2) is given, followed by the percentage of total area (in parentheses), and the locality. The zones are listed in order from north to south.

†Productivity: number days rain/year × (Mean annual temperature/Mean annual temperature range). Number of days rain/year is closely correlated to mean annual rainfall.

year (Fig. 1.2); there is typically a 'wet season' comprising the months when there is a lot of rain and many rainy days, and a 'dry season' when little or no rain falls and there are few, if any, rainy days. The division between wet and dry seasons is not clearcut, but it is a convenient way to indicate the general pattern of rainfall. In the rainforest zone, the wet season is prolonged, usually 10–12 months each year, and the dry season is short or non-existent. Within the wet season, the monthly rainfall varies as shown in Fig. 1.2; there is a gradual increase in monthly rainfall from January to a peak in June, then a slight decrease in July and August, another peak in September and October, and finally a decline to December. Thus, the rainfall shows a bimodal pattern, with two peaks of rainfall each year.

North of the rainforest zone, the patterns of rainfall and temperature change gradually with each degree of latitude further north. The overall effect is that the climate of the extreme north is very different to that of the south (Fig. 1.2, Table 1.1). The main climatic changes from south to north are an increase in mean monthly maximum temperature, a decrease in mean monthly minimum temperature, an increase in the annual and monthly range of temperature, a decrease in annual rainfall, an increase in the number of months with less than 25 mm of rain, and a decrease in the number of rainy days each year. Thus, the climate ranges from a typical wet, humid, sultry climate in the south to a hot, dry, semi-desert climate in the north, with a wide range of intermediate climates in between. Altitude also effects climate, as on the Jos Plateau where rainfall is higher and temperatures are cooler than on the surrounding savannas at lower altitudes.

The different climatic regimes tend to run in broad bands across the country from east to west, as shown in Fig. 1.3 for annual rainfall. In the centre of Nigeria, the east–west pattern is modified by the Jos Plateau; here, rainfall is higher than in the surrounding savannas. This is due to the higher altitude and cooler temperatures of the plateau, which cause the rain-clouds travelling inland from the south-west to drop most of their rain on the plateau, and on the south-west and north-west slopes of the plateau. A side effect of this is that there is only 500–600 mm/year to the east of the plateau.

The climate determines, to a large extent, the distribution and characteristics of the vegetation zones described in the next section.

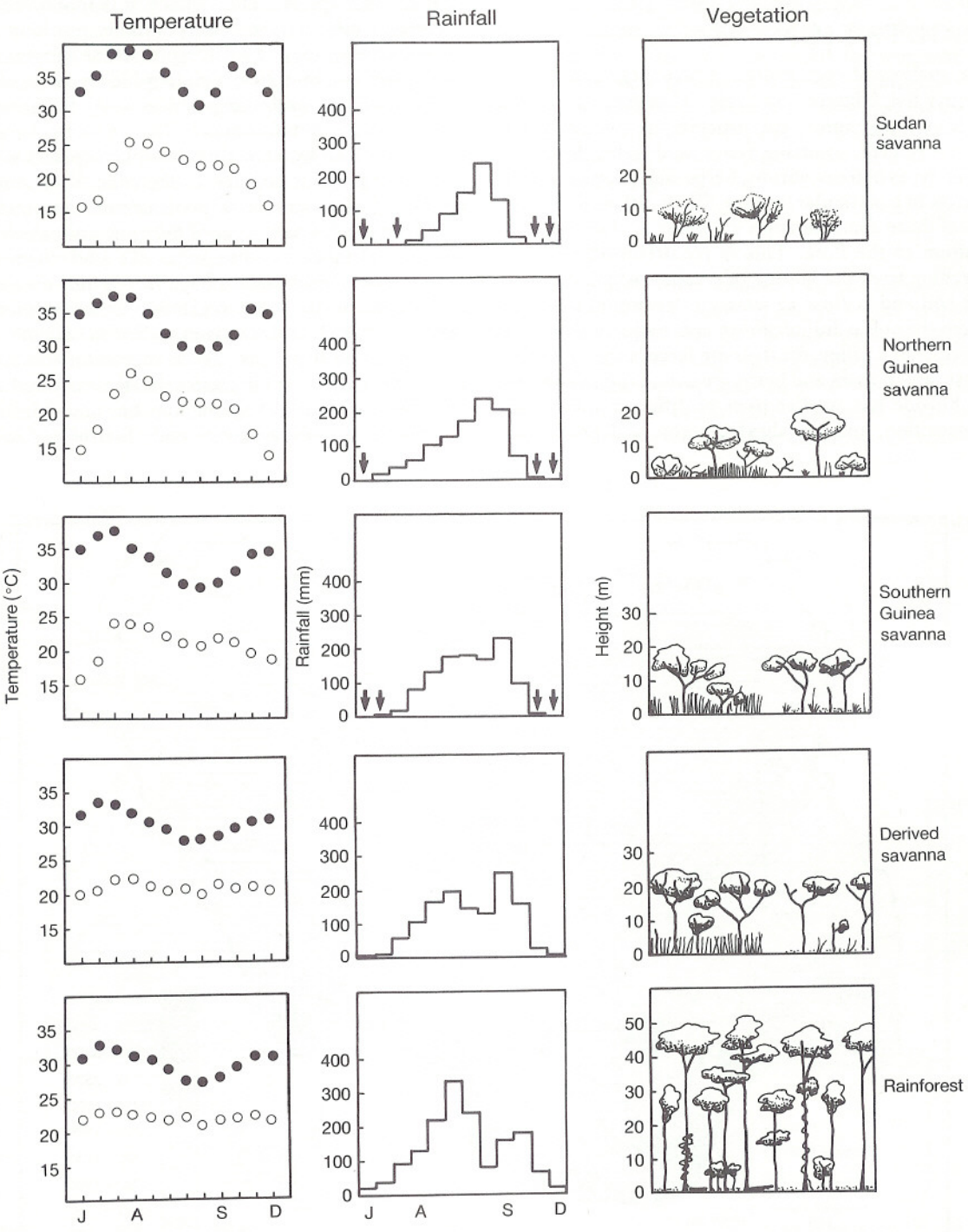


Fig. 1.2. Temperature, rainfall, and vegetation profiles of five vegetation zones of Nigeria. Temperature: ●, mean monthly maximum temperatures; ○, mean monthly minimum temperatures. Rainfall: mean monthly rainfall, arrows indicate months with less than 10 mm rain. Vegetation: left half, wet season; right half, dry season (Happold 1985).

VEGETATION

The analysis of vegetation in a very large and diverse country like Nigeria is not easy. Many characteristics, such as topography, soil structure and composition, annual rainfall, available water, and light, determine which types of trees, shrubs, herbs, and grasses are able to grow in a particular locality. Slight differences in any one of these characteristics are likely to alter the composition of the flora. This is readily observed when travelling from the bottom of a valley, which has deep rich soil and is close to water, to the top of a hillside where the soil is full of stones and rocks, and water is scarce. In the valley, the trees are large, shrub growth is dense, and grasses and herbs are abundant; in contrast, the hillside has smaller trees of different stature and composition, and the shrubs, herbs, and grasses are stunted and sparse. Thus, many different forms of vegetation may exist in close proximity resulting in a mosaic of vegetation types. Despite all the variations in local plant communities, regions which have a similar plant structure and composition may be grouped together as a 'vegetation zone'. Often, a particular zone is distinguished by a few abundant plant species which give a particular 'character' to the zone. Each zone is composed of a number of plant communities, which may be regarded as typical of the zone and which are different to those in other zones. To understand the distribution of mammals in Nigeria, it is only necessary to distinguish five main vegetation zones: rainforest, derived savanna, Guinea savanna, Sudan savanna, and Sahel savanna (Fig. 1.4). These vegetation zones may be further subdivided if greater detail is required. For example, the Guinea savanna may be subdivided into 'Northern Guinea savanna' and 'Southern Guinea

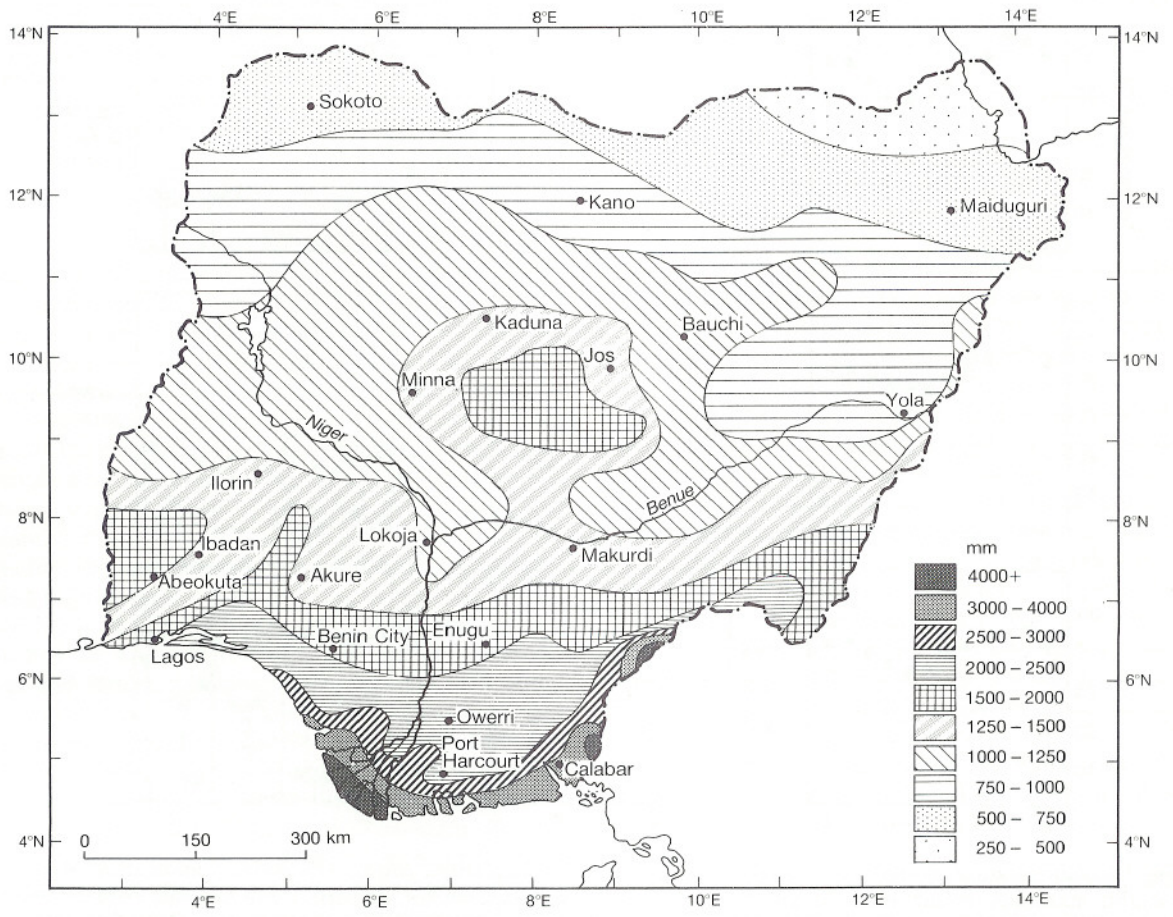


Fig. 1.3. Rainfall map of Nigeria (after Federal Surveys, Nigeria 1967).

savanna' because of changes in the composition of the trees in the north and south. Similarly, the rainforest zone may be subdivided into the lowland rainforest, which is very widespread, and the swamp (or mangrove) forest along the coastal fringes of the Niger delta.

The boundaries of each vegetation zone are not clearly defined; there is a gradual merging into the adjacent zones, perhaps over a distance of up to 50 km. Furthermore, vegetation typical of one zone may be found well inside an adjacent zone where local conditions are suitable. Most of the distribution maps and general comments on mammalian distribution are related to the main vegetation zones. However, it is important to keep in mind that the habitat(s) of a particular species of mammal within a vegetation zone depends on the *precise* characteristics of the soil and vegetation which may not necessarily be inferred from the characteristics of the vegetation zone as a whole. However, despite its deficiences, the classification of vegetation into zones is very useful for mammalian studies. Brief descriptions of each vegetation zone are given below, and further details are provided for some localities in Chapters 15, 16, and 17. These vegetation zones extend right across West Africa in a series of parallel bands (Fig. 1.4).

Rainforest zone

Moist semi-deciduous rainforest covers most of the southern part of the country, except in the extreme south-west corner near the border with the Benin Republic. The climate of Nigeria supports the driest sort of tropical forest and many tree species are deciduous for part of the year. The most important families of forest trees are Sterculiaceae, Ulmaceae,

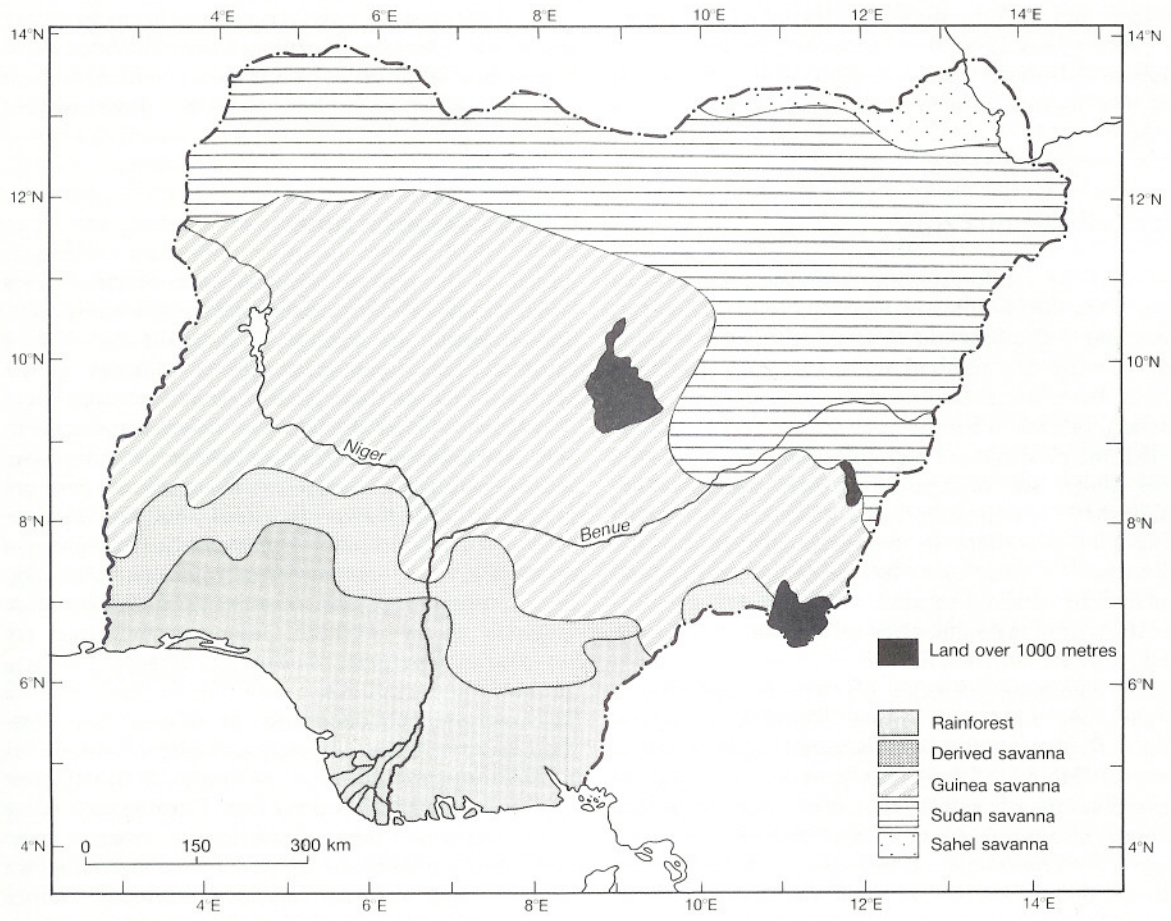


Fig. 1.4. Vegetation map of Nigeria (after Rosevear 1953).

and Moraceae. The emergent trees are 15–36 m (50–120 ft) tall and they form a discontinuous canopy layer. The lower trees, 7–15 m (25–50 ft), form a dense canopy with the crowns of many trees touching each other. These tall trees produce dense shade except where a tree has fallen, and sunlight can temporarily reach the forest soil. Shrubs and young trees form a patchy layer 1–5 m above the ground. The herb layer is formed of shrubs, tree seedlings, and herbaceous plants, although in deeply shaded parts of the forest, the herb layer is practically non-existent. Grasses are very rare in rainforest. The forest soil is covered with dead leaves during the dry season; these decompose gradually during the wet season, due to the action of fungi and many sorts of invertebrate animals, leaving the soil almost bare.

Much of the lowland rainforest has been destroyed by farming, by the removal of indiginous trees for timber, and by the establishment of plantations of exotic trees. When rainforest is cut down, the increased sunlight and warmth stimulates the growth of herbs and shrubs, resulting in a 'secondary tangle', and, if undisturbed, there is a succession of different shrub and tree species until eventually secondary forest is formed.

Derived savanna zone

North of the rainforest zone is the derived savanna zone. This zone is climatically similar to the rainforest zone, but a combination of farming, timber-cutting, and burning has resulted in clearings in the forest which have been colonized by grasses and fire-resistant savanna trees. The grasses are burnt annually so that the clearings are maintained and the rainforest trees which are susceptible to fire cannot be re-established. This process has encouraged the spread of savanna conditions so that, gradually, most of the rainforest in this zone has been destroyed and replaced by 'derived savanna'. Relics of former rainforest occur along some river valleys and in localities unsuitable for cultivation.

The commonest species of trees in the derived savanna are *Lophira lanceolata*, *Butyrospermum paradoxum*, *Burkea africana*, *Daniellia oliveri*, and *Pterocarpus erinaceus* (Hopkins 1965). The general appearance of derived savanna is similar to that of southern Guinea savanna, and the presence of semi-fire-resistant trees such as *Triplochiton*, *Terminalia*, and *Chlorophora* indicate that the derived savanna was formerly part of the rainforest zone. Trees in the derived savanna grow to about 12 m (40 ft) and in places they form a dense cover over the grass layer. Many trees are gnarled and mis-shapen, because of frequent burning and regrowth. Many species lose their leaves at the beginning of the dry season and the dead leaves form leaf litter on the ground, but this is never as dense as in the rainforest zone as most of it is burnt; where there is no burning the leaves decompose during the wet season.

In the derived savanna, as in all savannas, grasses grow very densely and, by the end of the wet season, they are 1.5–2.5 m (5–8 ft) tall. Most of the grass is burned at the beginning of the dry season in December or January, when the grass is only partially dry. Consequently, the effects of the fire are not too severe. The dryness of the grass varies with the topography, and some grasses in low-lying regions remain moist and unburnt. The pattern of burnt and unburnt grass varies from year to year, depending on the dryness of the grass and the date of burning. After burning, the soil is covered with ash which gradually adds nutrients to the soil. Grass tussocks and tree suckers begin to sprout within a few weeks of burning, before the wet season begins in March or April. Grasses continue to grow until August or September, when they flower and set seed.

Guinea savanna zone

North of the derived savanna zone is the Guinea savanna zone. The structure of the trees, burning cycle, and regrowth are similar to those of the derived savanna. The commonest species of trees in the southern Guinea savanna are *Lophira lanceolata*, *Daniellia oliveri*, *Afzelia africana*, and *Terminalia glaucescens*, and the commonest grasses belong to the genera *Andropogon*, *Hyparrhenia*, and *Pennisetum*. There are occasional relic forests (or forest outliers) in river valleys, which are similar in structure and composition to the forests of the rainforest zone. The transition from southern to northern Guinea savanna takes place gradually as the southern Guinea savanna trees are replaced by *Isoberlinia*, *Monotes*, and *Uapaca*. The trees are lower and less dense than in the southern Guinea savanna, although dense clumps may occur in low-lying habitats close to water, and where burning has been infrequent. Grasses, 1.5–3 m (5–10 ft) tall, grow in open habitats in the wet season. Burning takes place at the end of the rains. Tussocks and suckers sprout more slowly than in the derived and southern Guinea savannas and consequently, the northern Guinea savanna appears to be barren and unproductive for a longer period of the year that the savannas in the south.

Sudan savanna zone

North of the Guinea savanna zone is the Sudan savanna zone which covers nearly one-third of the area of Nigeria (Table 1.1). The vegetation is generally less dense and of lower height than in the Guinea savanna, and the grasses are less luxuriant. The transition from Guinea to Sudan savanna is marked by the absence of *Isoberlinia* trees (Rosevear 1953), which are so characteristic of the northern Guinea savanna. Typical trees of the Sudan savanna are *Acacia* spp., *Combretum*, *Sclerocarya*, *Balanites*, *Anogeissus*, and *Ziziphus*, and in particular the widespread silk cotton *(Bombax)* and baobab *(Adansonia)*. A very characteristic feature of the Sudan savanna zone is the change in vegetation with changes in soil and drainage. For example, many square kilometres may support pure woodlands of *Anogeissus*, which are then replaced by *Combretum* woodland and by *Boswellia* where rocky outcrops are numerous. These changes in plant composition are more evident in the Sudan savanna than in the Guinea savanna. Small patches of Guinea savanna trees, similar to the relic forests of the Guinea savanna, frequently occur in suitable low-lying habitats. Annual burning of grasses does not occur as regularly as in the Guinea savanna because the Sudan savanna grasses are comparatively sparse and stunted. When fires do occur, the sprouting of tussocks and suckers is often delayed for many months, so the country looks barren until the next wet season.

River valleys in the Sudan savanna zone are often wide and flat with thick alluvial soil. These valleys (called 'fadamas' in Hausa) have a dense growth of grasses, sedges, and rushes, and are bordered by riverine forest and *Borassus* palms. They remain damp, and contain water long after other regions have become dry and waterless. Other parts of the Sudan savanna zone have clay soils which retain water well into the dry season. These areas, called 'fikiris' and 'tabkis', remain green and lush long after the grasslands and woodlands on sandy soils have dried out.

Sahel savanna zone

The most northerly vegetation zone is the Sahel savanna zone which occupies only about 4 per cent of the area of Nigeria in the extreme north-west of the country. The Sahel savanna zone is an extensive band of vegetation across Africa, south of the Sahara, although only a very small portion of it occurs within Nigeria. This hot, semi-arid zone is characterized by *Acacia* spp., *Calotropis* shrubs, and saltbushes, and an absence of most of the tree species characteristic of the Guinea and Sudan savanna zones. The trees, shrubs, and grasses are sparsely distributed and are generally small in size, with broad patches of bare soil or sand between clumps of vegetation. The composition of the vegetation varies with soil type, particularly in relation to the water-holding qualities of the soil. Fikiris, as in the Sudan savanna, support a denser growth of grasses than other habitats.

RIVERS, LAKES, AND WATER

The availability of water is one of the most important characteristics determining the patterns of vegetation in Nigeria. The availability of water varies according to season and locality. Regions with high rainfall, river valleys, and areas with water-retaining soils have a richer more luxuriant vegetation than elsewhere. The major rivers of Nigeria, such as the Niger, Benue, and other rivers in the south of the country, contain flowing water all year, but other rivers are reduced to a series of isolated pools for most of the dry season. Streams and rivulets only contain water immediately after rain, and in the second half of the wet season when their catchment has absorbed sufficient water to provide a continuous flow. In some localities, springs provide a source of water in otherwise waterless habitats. Some localities contain water for longer periods because of their physical characteristics; for example, low-lying swamps, the land around inselbergs, and the valleys below densely-covered hillsides.

Seasonal variations in the availability of water, particularly in relation to the wet and dry seasons, are of great importance to mammals (p. 263). Species which need to drink each day or every few days have to stay within easy reach of water all the time. Such species are either large and capable of travelling several kilometres to reach water, or small species which never move away from moist habitats. The annual and seasonal distribution of these species is closely related to where water or moist vegetation are available. Species which do not need to drink frequently, may survive in habitats which are far from permanent water. Mammals exhibit a wide range of variation in their water requirements and, consequently, the availability of water determines their annual and seasonal distribution. It is usually the dry season, when water is scarce, which limits the distribution of many species and prevents many water-dependent species from inhabiting the drier savannas. The availability of water also determines the patterns of reproduction, and hence population numbers, of many species (p. 305).

These three environmental characteristics—climate, vegetation, and the availability of water—are closely interrelated. Changes in one are usually associated with changes in the others. Climate is probably the most important although the fine details of vegetation and the availability of water are important as far as mammalian distribution and biology are concerned. The very conspicuous gradient in climate, vegetation, and in the availability of water from south to north, is reflected in corresponding changes in vegetation height, food resources, and plant productivity (Table 1.1). The influence of all these parameters on the distribution and biology of Nigerian mammals is evident throughout this book. More detailed descriptions of Nigerian geography and vegetation are given by Hopkins (1965), Iloeje (1965), Rosevear (1953), and Udo (1970).

The mammals of Nigeria

Nigeria has a very rich and diverse mammalian fauna: 247 species are known to occur (Table 1.2), and it is likely that additional species may be found, especially in the montane and forested regions near the Cameroun border. These species belong to 13 orders, 42 families, and 133 genera. Some orders are well represented; the rodents and bats, for example, account for over half the species, while the carnivores and antelopes account for about a further one-quarter of the total. In contrast, other orders such as the insectivores, monkeys, hares, pangolins, and hyraxes are less well represented, and there are four orders (Tubulidentata, Sirenia, Proboscidea, and Perissodactyla) which only contain one species. The grouping of species into genera, families, and orders is based on degrees of similarity (Table 1.3) and indicates the relationships between species. The general arrangement and representation of families and genera within the 13 orders is similar to that in most other African countries (see p. 298), although the species themselves vary considerably in different countries.

Table 1.2. The numbers of families, genera, and species of mammals in Nigeria

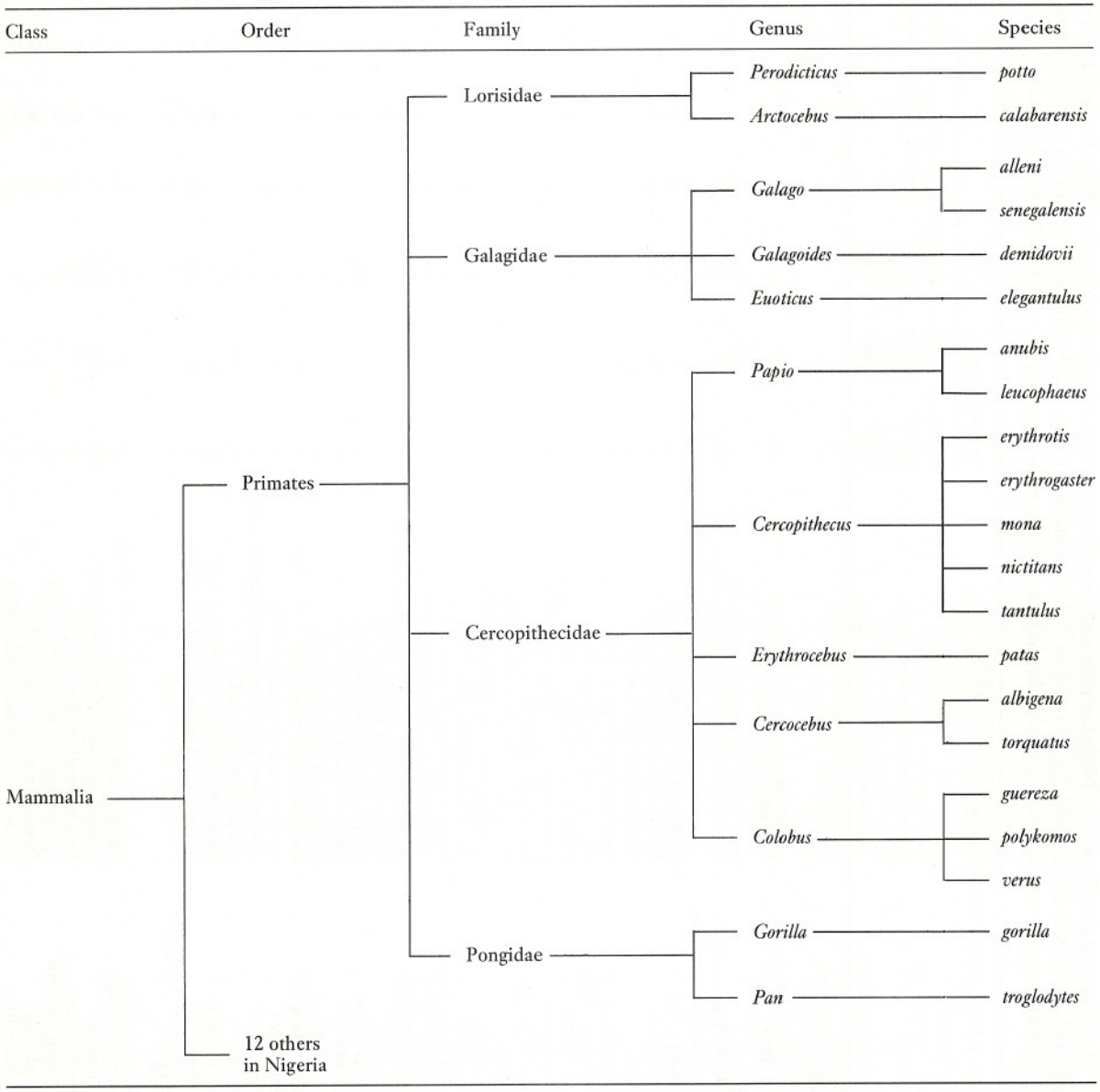
Order	Families	Genera	Species	% of total fauna
Insectivora	3	5	26	10.5
Chiroptera	8	29	71	28.7
Primates	5	11	21	8.5
Pholidota	1	1	2	0.8
Lagomorpha	1	1	2	0.8
Rodentia*	9	37	54	21.9
Carnivora	5	22	33	13.4
Tubulidentata	1	1	1	0.4
Sirenia	1	1	1	0.4
Proboscidea	1	1	1	0.4
Hyracoidea	1	2	2	0.8
Perissodactyla	1	1	1	0.4
Artiodactyla	5	21	32	13.0
Totals	42	133	247	100

*Including three commensal exotic species (*Rattus rattus*, *R. norvegicus*, and *Mus musculus*).

Each species is distributed within one or several vegetation zones. Table 1.4 lists all the species by order and family, indicating the vegetation zones where each species may be found; it also shows whether a species has a widespread or a restricted distribution. The exact localities where a species has been found and the habitat within a vegetation zone where it lives is recorded in the account of each species.

The exact number of species of mammals in Nigeria is difficult to determine for four main reasons: changes of names, alteration of the boundaries of Nigeria, local extinctions, and lack of adequate investigation. Firstly, many species were described on the basis of a single specimen, but subsequently, some of these 'species' have been shown to be varieties of a single species. Thus, the original, say six, species, each with its own name, are reduced to a single species. When this happens, the first-used name becomes the official name of the species. Sometimes, the opposite occurs and an original species is later considered to contain two or more similar and closely-related species. The number of species depends, to a large extent, on the judgement of biologists who identify and classify animals. In actual fact, each species is, by definition, totally separate from all other species, because species are unable to interbreed. However, the distinctions between some closely-related species and between subspecies (geographical varieties of the same species) are so slight that judgement on whether a species really is a species is very difficult. Mammals and all other living organisms are evolving and changing all the time; such changes are difficult to perceive as they take many generations to occur, but during the course of

Table 1.3. The principles of classification, illustrated by the Primates of Nigeria. Mammals are classified by order, family, genus, and species. Each species is distinct with its own specific characteristics. However, all species in the same genus share common generic characteristics, all genera in the same family share common family characteristics, and all families in the same order share the common order characteristics. Thus, classification shows different levels of similarity and relationship. Some species show geographical variation and may have several subspecies (see p. 20).



evolution the boundaries between one species and a second species evolving from the first, may be difficult to define.

The second reason is the result of changes to the geographical boundaries of Nigeria. Minor changes in the Nigeria–Cameroun border south of Lake Chad had no effect on the composition of the Nigerian fauna. Of much greater importance were changes to the border in the south-east of the country. Prior to 1961, Southern Cameroun, comprising Cameroun and Bamenda Provinces, was part of the Federation of Nigeria. These Provinces included Cameroun mountain, and large areas of the Cameroun highlands covered with rainforest or montane grasslands. When, in 1961, Southern Cameroun voted to join the Cameroun Republic, many species of mammals confined to the highlands could no longer be considered as 'Nigerian' mammals. It is possible that some of these mammals may occur on the lower slopes of the highlands in the Obudu-Oban-Okwango-Boshi region which are still part of Nigeria; however, this region is poorly known zoologically and no definite information is available.

The third reason is due to the extinction of a species. To prove that a species is extinct is difficult, as lack of recent observations or records does not necessarily prove that the species no longer exist. Only Rhinoceroses, Giraffes, Cheetahs, and Gorillas are considered to be extinct, or close to extinction, in Nigeria. These species are included in this book because there is good evidence that they lived, in recent times, well within the present boundaries of Nigeria.

Appendix 4 lists the species which were included as Nigerian mammals by Rosevear (1953), but which are probably no longer present for the reasons given above.

How to use this book

The methods of identification and descriptions of each species follows a standard format. The following notes explain how to identify species quickly and how to locate information about any particular species. Further information on a species may be given in and can be traced through the Index.

KEYS FOR IDENTIFICATION

The first step when looking at an unidentified mammal is to find out its name. For most mammals, it should be possible to identify the mammal to the species, although for several similar, closely-related species it may only be possible to determine the genus. Identification is accomplished by using keys. Each key consists of a number of paired alternatives, one of which is correct for the mammal being identified. For example, the first key (p. 21) starts with the choice of whether wings are present, or not present. If wings are present, the key indicates that the mammal is a bat (Chiroptera) and that the key to find out what sort of bat may be found on p. 36. This key is to the suborders of Chiroptera and indicates whether the bat belongs to the Megachiroptera (fruit-bats) or the Microchiroptera (insectivorous bats); if it is the former, the key refers to p. 37 which allows precise identification of the species. If, for example, the species is *Nanonycteris veldkampi*, this last key states that the full details about the species may be found on p. 46. In all the keys, the correct choice of the two alternatives leads on to the next pair of alternatives until, finally, the name of the species is reached. To return to the fruit-bat example above, if the species is *Nanonycteris veldkampi*, the choices and decisions in the key on p. 37 are:

Number in key	Decision
1	2
2	3
3	4
4	5
5	8
8	*Nanonycteris veldkampi* (p. 46)

SPECIES ACCOUNTS

The account of each species is composed of nine sections as described below.

Common name

There are no official common names for mammals. The common names used in this book are those most frequently used by other authors and are accepted as being the most appropriate name. For some species, two common names are given, the first being the preferred one; because common names are not

standardized, there are numerous examples where the same common name has been used for several species, and where a single species has many common names. Common names are used extensively throughout this book as, for most people, they are the easiest to use and remember. Table 1.4, some other tables, and the account of each species give both common and scientific names so there can be no confusion as to the species referred to by each of the common names used in this book.

Scientific name

For most species, scientific names follow Meester and Setzer (1971–7), In the accounts of each species, the scientific name is linked to the common name, and the common name is used extensively in much of the text. Only Table 1.4 records the full scientific name with the describer's name and date.

Distribution

This is simply a concise statement of the distribution of each species in relation to the vegetation zones. In addition, there is a distribution map (p. 355–373) for each species which has been reliably recorded from more than two localities. Each map gives a visual impression of distribution, although there are, of course, many localities where a species occurs, even though there are no records. Each species tends to be distributed throughout the whole of a vegetation zone even though records show a patchy or localized distribution. Thus, a species recorded from, for example, Gombe, is likely to occur throughout most, if not all, of the Sudan savanna zone. This generalization is not true for the rainforest zone, where the major rivers act as barriers (p. 248), and therefore the distribution of many of the rainforest mammals is either west of the Niger river, east of the Niger river, or east of the Cross river.

Localities

The names of all localities where a species has been recorded are given in alphabetical order and the source of each record is given in brackets after the locality name. The principle sources are museum specimens, confirmed sight records of biologists in the field (see Table 1.5 for sources and abbreviations), and published information in books and scientific journals. This last source of information is indicated by the surname of the author(s) and date of publication (e.g., Child 1974) and the full details are given in the Biblio-

Table 1.5. Unpublished sources of information on the distribution of Nigerian mammals

Abbreviation	Definition
AD	A. Demeter, formerly Ahmadu Bello University, Zaria, now Hungarian Natural History Museum, Budapest, Hungary (personal observations and collections)
BM	British Museum of Natural History, London (collections)
CS	C. Smeenk, formerly Wildlife Officer, Pandam Wildlife Park, now Natural History Museum, Leiden, Belgium (personal observations, and collections in Leiden Museum)
DH	D. C. D. Happold, formerly University of Ibadan, Ibadan, now The Australian National University, Canberra (personal observations and collections)
HZM	Harrison Zoological Museum, Sevenoaks, Kent, England (collections, courtesy D. L. Harrison)
IRC	I. R. Colquhoun, formerly Wildlife Officer, North-east State and Gongola State (personal observations)
JM	J. I. Menzies, formerly University of Ife, Ile-Ife (personal observations and collections)
JO	J. F. Oates, formerly University of Nigeria, Nsukka (personal observations and collections)
MG	Mary Gartshore, formerly Ahmadu Bello University, Zaria (personal observations, and collections now mostly in Royal Ontario Museum, Toronto, Canada)
NHI	Natural History Museum, University of Ife, Ile-Ife (collections, mostly by D. R. Rosevear and J. I. Menzies)
PM	P. J. Marshall, formerly Game Warden, Yankari Game Reserve (personal observations)
RSM	Royal Scottish Museum, Edinburgh, Scotland
SMF	Senckenberg Museum, Frankfurt, Germany (collections, courtesy D. Kock)
UIZ	University of Ibadan Zoological Gardens, Ibadan (records, courtesy R. R. Golding)
USNM	United States National Museum, Washington DC, U.S.A. (collections, courtesy R. Thorington and C. B. Robbins)
VUI	Virus Research Laboratories, University of Ibadan (collections and records)
WR	W. Reed, formerly F.A.O. Fisheries Officer, Lokoja
ZMA	Zoology Museum, University of Amsterdam, Holland (collection, courtesy W. Bergmans)
ZMB	Zoological Museum, Berlin
ZUI	Zoology Museum, University of Ibadan (collections)

graphy. The geographical coordinates of all locality records are listed in Appendix 2.

Status

It is extremely difficult to determine the abundance of a species. Yet it is of great interest and importance to know if a species is common or rare, because this indicates how easily a species may be seen or found and, in some cases, its effect on the environment. All comments on status refer only to the known geographical range of the species.

A further aspect of status is how it may have changed with time. Unfortunately, no documentation is available for small species, but if the ecology and environmental requirements of these species are known, it is possible to assess how changing land-use may have affected their status. For larger species, the present status may be compared with published information on numbers and geographical range in the past. Thus, for some large species such as Elephants, Hippopotamuses, Rhinoceros, Giraffes, Lions, Cheetahs, and many antelopes, there is adequate information to show that status has changed with time.

Identification

Measurements and descriptions are essential for identification. Measurements are given in one of two ways. 'Average measurements' are given when a number of specimens from Nigeria were weighed and measured; such measurements are recorded as the average measurement, followed (in parentheses) by the range of measurements, e.g. 63 (51–79). 'Typical measurements' are given when accurate data were unavailable, such as when only one Nigerian specimen was available, or when measurements were made on specimens from other parts of Africa. All measurements are given in millimetres and all weights in grams, unless otherwise stated. The definitions of standard measurements and weights are listed in Table 1.6.

After the measurements there follows a description

Table 1.6. Standard measurements for mammals. Linear measurements in millimetres, and weights in grams, unless otherwise stated

Abbreviation	Measurement	Details
HB	Head and Body	From tip of nose to base of tail.
T	Tail	From base of tail to tip of tail, excluding terminal hairs.
HF	Hindfoot	From heel to tip of longest toe, excluding nail or claw.
E	Ear	From notch to tip, excluding terminal hairs.
TLS	Total length of skull	From anterior part of skull (nasal bone or incisor teeth) to most posterior part of skull.
CI	Condylo-incisive	From most anterior part of incisor teeth to condyles at back of skull; similar to TLS except that the most anterior part of the skull is the incisor teeth, not the nasal bone; shrews only.
FA	Forearm	Total length of radius bone or forearm (see Fig. 3.1); bats only.
SH	Shoulder height	From ground level to highest point of shoulder; large mammals only, e.g., some carnivores, antelopes, elephants, etc.
TL	Total length	From tip of nose to end of tail; used when difficult to distinguish HB from T; Manatee only.
HL	Horn length	From base of horn to tip of horn, along the front edge; Bovidae only.
WT	Weight	Total weight of animal.
nd	No data	No information on this measurement.

of the principal diagnostic features of the species. Where appropriate, this is followed by a list of similar species with which it could be confused. As some of the descriptive terms are not used in everyday English, these terms are defined in the Glossary (Appendix 1).

Ecology

This describes how each species lives in its natural environment. Wherever possible, information is taken from studies on Nigerian individuals and populations; where this is not possible, a general idea of the amount of ecological characteristics of the species is derived from studies in other parts of Africa. The ecological information available for each species is very variable; for well-known species, habitat requirements, food preferences, social organization, domiciles, locomotion, seasonal movements, and community structure are recorded. For lesser known species, only a few general comments on the habitat of the species are possible. The lack of information on the ecology of most Nigerian mammals offers a real challenge to naturalists and biologists.

Reproduction

Reproductive patterns, breeding seasons, litter size, and details of the young are recorded in this section. As for 'Ecology', there are considerable differences in the amount of detail available for each species.

Taxonomic note

This section describes subspecific variations (if relevant), and records any other names which have been used in recent publications on Nigerian mammals. Species with widespread geographical ranges may show variations in some of their characteristics, especially when individuals from one end of the range are compared with individuals from the opposite end. When such individuals are sufficiently different, and geographically isolated from each other, they may be considered as different subspecies. Conversely, other species which do not show such geographical variation, are not divided into subspecies. The presence of a subspecies is indicated by a third name, written immediately after the specific name, e.g., *Heliosciurus gambianus gambianus*. Two examples illustrate the subspecies concept. Firstly, the Senegal Galago, *Galago senegalensis*, occurs throughout most of the savannas of Africa, but there are quite obvious differences in the size and colouration of individuals from different parts of the continent. These differences are sufficient to justify dividing this species into eight subspecies (Hill and Meester 1977). The Senegal Galago in Nigeria belongs to the subspecies *senegalensis* (p. 88) and it is distinct from the other seven subspecies in Africa. Secondly, Bushbuck are also widespread throughout Africa and different populations show great variation in the pattern of white stripes on the sides of the body. Such differences have resulted in the naming of over 40 subspecies, although now only nine of these are considered to be valid (Ansell 1972). This second example shows the difficulties of deciding whether small differences are just minor variations within a population, or are sufficiently different and constant to justify the division into subspecies. In Nigeria, two subspecies of Bushbuck are recognized (p. 216). The first is the 'Harnessed Bushbuck', *Tragelaphus scriptus scriptus*, which has a harness-like pattern of white stripes on a chestnut-coloured background and occurs throughout West Africa. The second subspecies, *bor*, has a series of white vertical stripes, not like a harness, on a pale chestnut background and occurs from the Lake Chad region eastwards to the southern Sudan and Uganda. All subspecies can potentially interbreed (cf. species); in fact, they do not interbreed because each subspecies is geographically isolated from the other subspecies. Subspecies are not described in detail in this book because the concepts of subspeciation are difficult to understand, and the validity of many named subspecies is uncertain. However, it is important to realize that some species show variations in their characteristics throughout their geographical range.

The Taxonomic note also records the other names which have been used for the species in other works on Nigerian mammals, notably by Rosevear (1953). For example, Rosevear refers to the Korrigum as *Damaliscus korrigum*, but the current opinion is that the 'species' *korrigum* is a subspecies of the earlier named *Damaliscus lunatus* (Ansell 1971). Thus, Rosevear's *Damaliscus korrigum* refers to exactly the same species as *Damaliscus lunatus* in this book.

ILLUSTRATIONS

All the illustrations are drawn from Nigerian specimens, unless otherwise indicated, and the locality from which each specimen was obtained is recorded. Similarly, the photographs show mammals from Nigeria or Cameroun in their natural habitats.