



Assessment of the Population Dynamics of Diurnal Primates in Old Oyo National Park, Nigeria

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Abstract

Assessment of the population dynamics of diurnal primates in Old Oyo National Park, Nigeria, was carried out from March 2011 to March 2012. To date, there had not been any census carried out to ascertain the distribution of primate species within the park and the influence of biotic and abiotic factors, particularly, anthropogenic activities, hence, this study. Ten transect lines were located as representative samples in the park, farmers and hunters assisted me in providing information on the primate species present in the park. These include Red monkey (*Erythrocebus patas*), Green monkey (*Erythrocebus sebaeus*), Tantalus monkey, Tataras monkey, White-throated monkey (*Cercopithecus erythrogastar*), Putty-nosed monkey (*Cercopithecus nititans*), Baboon (*Papio anubis*) and Green colobus (*Colobus satanas*). Data were collected and analysed by calculating the mean numbers of primate species with respect to standard errors. The monthly mean number of each primate species encountered in the park were recorded as follows: Red monkey 20.10 ± 0.68 , Green monkey 16.00 ± 0.17 , Tantalus monkey 2.00 ± 0.00 , Tataras monkey 10.80 ± 0.97 , White-throated monkey 7.17 ± 0.31 , Putty-nosed monkey 4.20 ± 0.67 , Baboon 39.82 ± 1.47 and Green colobus, 20.50 ± 15.51 . From the result obtained, Tantalus monkey with mean number of 2.00 ± 0.00 , Putty-nosed monkey 4.20 ± 0.67 and White-throated monkey with the mean number of 7.17 ± 0.31 had become threatened or endangered. This census provides baseline information on the status of primate diversity and numbers within the park which can help to direct conservation efforts of the primates and other animals by various tiers of government. This will further enhance the sustainability of the park as enshrined in UNESCO: Man and the Biosphere Reserve, to which Nigeria is a signatory.

Keywords: Assessment, Population Dynamics, Diurnal Primates, Old Oyo, National Park, Nigeria.

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INTRODUCTION

The primates are in the Order of animals which comprises of Prosimians, Monkeys, Apes and Humans. The name 'primate' is derived from the Latin word '*primus*' which means 'first' or 'foremost'. They are referred to by this name because they have a brain of the first rank, i.e., they are the most intelligent among the animals (Burton, 1985). The primate Order comprises a wide spectrum of some 200 living species as well as a large number of extinct fossil forms (Eimerl and DeVore, 1975). Primates do not, like other groups of mammals, have any single feature that is common to their group. Nevertheless there are some general features that can be used to identify an animal as a primate. These features include very mobile fingers and toes, hands and feet which are adapted for grasping, opposable digits, eyes on the front of the face – binocular vision, finger and toe nails, pads on the tips of digits which are sensitive to touch, a flatter face (shorter snout) than many other mammals, a bigger, more complex brain relative to body size. All primates share common adaptation to living in the trees, and all, share the ability to climb by grasping because they have hands with movable fingers. The above combination of characteristics makes them well adapted to many different environments. This study aims to investigate the diurnal activities of primates in Old Oyo National Park. Such knowledge is necessary for effective management and conservation of primates' population.

There are seven National Parks in Nigeria, namely: Old Oyo National Park in Oyo State, Kainji Lake National Park in Niger State, Chad Basin National Park in Maiduguri, Dachankar gumti National Park between Taraba and Adamawa States, Cross River National Park in Cross River State, Okomu National Park in Edo State and Kamuku National Park in Kaduna State.

Old Oyo National Park was founded in the year 1999. It is a large area of land that was established by the Federal Government of Nigeria in Oyo North of Oyo State through the promulgation of Decree 46 of 1999. The purpose was mainly for conservation, preservation and protection of our natural resources. It also contained historical resources from Old Oyo Empire. The motto of the park is "Blending of our glorious park with nationhood". The park is made up of five ranges namely: Marguba range in Sepeteri, Oyo Ile range in Igbeti, Yemoso range in Ikoyi-Ile, Tede Park in Tede, Sepeteri range in Igboho. Old Oyo National park like most other parks in Nigeria needs increased protection if it is to be sustained for the future. It provides a thriving habitat for a range of wild fauna among which are primates which inhabit the guinea savannah trees but the wildlife component has not yet been well researched.

Statement of Research Problem

Primates are essential components of animal diversity because of their prominent position in the phylogenetic tree. These species and their habitats are threatened by logging, poaching and encroaching farmlands. The last census of wild animals in Nigeria was conducted during the colonial period and it only indicated the presence of the primates and not their numbers. There is no information on the diversity and population size of diurnal primates in Old Oyo National Park, hence this study.

The threats posed to animals in the park as a result of hunting for bushmeat, exploitative influence of modernization by the industrialized world, unsustainable logging, environmentally degrading agricultural practices, and plantation forestry, are very prominent in our parks and needs to be looked into to see the extent of their impact on these primates and to come up with regulatory measures. The scope of this research will be limited to the inventory and enumeration

of the species encountered, weather condition at the time of encounter, height above the ground of groups encountered on trees, numbers in a troop, activity at detection, perpendicular distance from the transects in meters and habitat type where group are sighted. Activities at detection which premised on three principal components; feeding, grooming and travelling will be monitored. This also includes distribution of males and females, adult to juveniles. To this end, the objectives of this research work are to:

- Determine and provide information on the number of existing diurnal primates, their diversity and population size.
- Investigate the roles and interrelationship of both biotic and abiotic factors on the distribution of the diurnal primates within the National Park with a view to ensuring their sustainability.
- Identify the primates that are highly endangered or threatened with extinction within the park.
- Determine the abundance of the various species.

It is hoped that this study will provide useful information on the diversity and estimated populations of primate species in Old Oyo National Park which is a part of the Southern Guinea Savannah area of Nigeria. It will also provide information on factors that affect the distribution of the primates and their interrelationships within the National Park.

LITERATURE REVIEW

Africa is a continent of particular concern in terms of global primate conservation (Cowlshaw and Dunbar, 2000; Chapman et. al., 2006; Marshall and Hovet, 2006). Many primate species are threatened and it is apparent from studies that population of primates are on the decline generally and in Nigeria in particular as a result of anthropogenic activities (Anadu & Oates, 1982; Eniang, 1999; Agbelusi et. al., 2003; Ogunjemite, 2007; Oates et.al., 2008). Twenty eight species of primates are represented in Nigeria as represented by International Union for Conservation of Nature (IUCN) in 1996. Many of them are diurnal and may be easily encountered in their different habitat refugia. Nigeria is among the fifteen countries worldwide scoring highest for primate species richness (Cowlshaw & Dunmbar, 2000).

Studies of primate community structure, association patterns and habitat diversity are rare in Nigeria. Studies of primate community structure increases our understanding of behaviours, adaptation and evolution because it enable us to formulate and to test hypothesis on patterns of competitions, predations and extinction (Lehman, 2000).Data on community structure provide some support to the theory that species in habitats with low level of food resources cannot support numerous polyspecific association due to increase in competition for food, low tree diversity while abundance and low fruit and leaf production may influence pattern of association among primates (Lehman,1999).

Kay et. al. (1997), indicates that plant productivity is the ecological variable most strongly correlated with primate species richness. Thus, low plant productivity in the park may reduce the abundant of food resources and result in scabble and competitions among primates.

Historical and modern terminology

The relationships among the different groups of primates were not clearly understood until relatively recently, so that commonly used terms are somewhat confused. For example, "ape" has been used either as an alternative for "monkey" or for any tailless, relatively humanlike primate. Sir Wilfred Le Gros Clark was one of the primatologists who developed the idea that there were trends in primate evolution, and that the living members of the order could be arranged in an ascending series leading to humans. Commonly used names for groups of primates, for example "prosimians", "monkeys", "lesser apes" and "great apes", reflect this arrangement.

According to our current understanding of the evolutionary history of the primates, several of these groups are paraphyletic, meaning that although all the species in the group descend from a common ancestor, the group does not include all the descendants of that ancestor. By contrast with approaches such as those of Le Gros Clark, modern classifications typically use groups which are monophyletic, since they include all the descendants of a common ancestor. Prosimians" contain two monophyletic groups, the suborder Strepsirrhini (lemurs, lorises and allies), as well as the Tarsiers, which are a sister group to the infraorder Simiiformes, "monkeys" consist of two monophyletic groups, New World monkeys and Old World monkeys, but exclude hominoids (superfamily Hominoidea), "apes" as a whole, and the "great apes" in particular, are not monophyletic because they exclude humans.

Thus, the two sets of groups, and hence names, do not match, which causes problems in relating scientific names to common names. Consider the superfamily Hominoidea. In terms of the common names on the right, this group consists of apes and humans, and there is no single common name for all the members of the group. One possibility is to create a new common name, in this case "Hominoids". Another possibility is to expand the use of one of the traditional terms. For example, in the Vertebrate Palaeontologist, Benton,(2005) wrote, "The apes, Hominoidea, today include the Gibbons and Orang-utan ... the Gorilla and Chimpanzee ... and Humans", thereby using "Apes" to mean "Hominoids". The group traditionally called "Apes" must then be called the "non-human primates".

There is no consensus as to which approach to follow, whether to accept traditional paraphyletic common names or whether to use monophyletic names, either new ones or adaptations of old ones. Both approaches will be found in biological sources, often in the same work. Thus although Benton defines "Apes" to include humans, he also repeatedly uses "Ape-like" to mean "like an Ape rather than a Human", and when discussing the reaction of others to a new fossil writes of "claims that Orrorin ... was an Ape rather than a Human".

Order Primates is part of the clade Euarchontoglires, which is nested within the clade Eutheria of Class Mammalia. Recent molecular genetic research on Primates, Colugos, and treeshrews has shown that the two species of colugos are more closely related to Primates than treeshrews, even though Treeshrews were at one time considered Primates. These three orders make up the clade Euarchonta. The combination of this clade with the clade Glires (composed of Rodentia and Lagomorpha) form the clade Euarchontoglires. Variouslly, both Euarchonta and Euarchontoglires are ranked as SuperOrders. Some scientists consider Dermoptera a suborder of Primates and call the "true" primates the suborder Euprimates.

Distinguishing Features

Primates have diversified habitat, arboreal (trees) and bushes and possess many characteristics that are adaptations to this environment. They are distinguished by: retention of the collar bone in the pectoral girdle; shoulder joints which allow high degrees of movement in all directions; five digits on the fore and hind limbs with opposable thumbs and big toes; nails on the fingers and toes (in most species); a flat nail on the hallux (in all extant species); sensitive tactile pads on the ends of the digits; orbits encircled in bone; a trend towards a reduced snout and flattened face, attributed to a reliance on vision at the expense of olfaction (most notably in Haplorrhines, and less so in Strepsirrhines); a complex visual system with stereoscopic vision, high visual acuity and color vision; a brain having a well-developed cerebellum with posterior lobe and a calcarine fissure; a large brain in comparison to body size, especially in simians; differentiation of an enlarged cerebral cortex; reduced number of teeth compared to primitive Mammals; three kinds of teeth; a well-developed cecum; two pectoral mammary glands; typically one young per pregnancy; a pendulous penis and scrotal testes; a long gestation and developmental period; and a trend towards holding the torso upright leading to bipedalism.

Primates generally have five digits on each limb (pentadactyly), with keratin nails on the end of each finger. The bottom sides of the hands and feet have sensitive pads on the fingertips. Most have opposable thumbs, a characteristic primate feature, though not limited to this order (Opossums, for example, also have them). Thumbs allow some species to use tools. In primates, the combination of opposing thumbs, short fingernails (rather than claws) and long, inward-closing fingers is a relict of the ancestral practice of gripping branches, and has, in part, allowed some species to develop brachiation (swinging by the arms from tree limb to tree limb) as a significant means of locomotion. Prosimians have claw like nails on the second toe of each foot, called toilet-claws, which they use for grooming.

Locomotion

Primate species move by brachiation, bipedalism, leaping, arboreal and terrestrial quadrupedalism, climbing, knuckle-walking or by a combination of these methods. Several prosimians are primarily vertical climbers and leapers. These include many Bushbabies, all Indriids (i.e., Sifakas, Avahis and Indris), sportive Lemurs, and all Tarsiers. Other prosimians are arboreal quadrupeds and climbers. Some are also terrestrial quadrupeds, while some are leapers. Most monkeys are both arboreal and terrestrial quadrupeds and climbers. Gibbons, muriquis and spider monkeys all brachiate extensively, with gibbons sometimes doing so in remarkably acrobatic fashion. Woolly monkeys also brachiate at times. Orangutans use a similar form of locomotion called quadramanous climbing, in which they use their arms and legs to carry their heavy bodies through the trees. Chimpanzees and Gorillas knuckle walk, and can move bipedally for short distances. Although numerous species, such as Australopithecines and early Hominids, have exhibited fully bipedal locomotion, humans are the only extant species with this trait.

Social Systems

Britanica (2010), stated that social systems of non-human primates are best classified by the amount of movement by females occurring between groups. He proposed four categories:

Female transfer systems – Here, the females move away from the group in which they were born. Females of a group will not be closely related whereas males will have to remain with their natal groups, and this close association may be influential in social behavior. The groups formed are generally quite small. This organization can be seen in Chimpanzees, where the males, who are typically related, will cooperate in defense of the group's territory. Among New World Monkeys, Spider monkeys and Muriquis use this system.

Male transfer systems – The females remain in their natal groups, the males will emigrate as adolescents. Polygynous and multi-male societies are classed in this category. Group sizes are usually larger. This system is common among the ring-tailed Lemur, Capuchin monkeys and Cercopithecine monkeys.

Monogamous species – a male–female bond, sometimes accompanied by a juvenile offspring. There is shared responsibility of parental care and territorial defense. The offspring leaves the parents' territory during adolescence. Gibbons essentially use this system, although "monogamy" in this context does not necessarily mean absolute sexual fidelity.

Solitary species – often males who defend territories that include the home ranges of several females. This type of organization is found in the Prosimians such as the slow loris. Orangutans do not defend their territory but effectively have this organization.

These social systems are affected by three main ecological factors: distribution of resources, group size and predation. Within a social group, there is a balance between cooperation and competition. Cooperative behaviors include social grooming (removing skin parasites and cleaning wounds), food sharing, and collective defense against predators or of a territory. Aggressive behaviors often signal competition for availability of food, sleeping sites or mates. Aggression is also used in establishing dominance hierarchies.

Primate Evolution

The primate lineage is thought to go back at least 65 mya (million years ago), even though the oldest known primate from the fossil record is Plesiadapis (55–58 mya) from the Late Paleocene. Other studies, including molecular clock studies, have estimated the origin of the primate branch to have been in the mid-Cretaceous period, around 85 mya. By modern cladistic reckoning, Order Primates is monophyletic. Suborder Strepsirrhini, the curly-nosed or "wet-nosed" primates, is generally thought to have split off from the primitive primate line about 63 mya, although earlier dates are also supported. The seven strepsirrhine families are the five related Lemur families and the two remaining families that include the Lorises and the Galagos. Older classification schemes wrap Lepilemuridae into Lemuridae and Galagidae into Lorisidae, yielding a four-one family distribution instead of five-two as presented here. During the Eocene, most of the northern continents were dominated by two groups, the Adapiforms and the Omomyids. The former are considered members of Strepsirrhini, but did not have a toothcomb like modern Lemurs; recent analysis has suggested *Darwinius masillae* fits into this grouping. The latter was related closely to Tarsiers, Monkeys, and Apes. It is unclear exactly how these two groups relate to extant primates. Omomyids perished about 30 mya, while Adapids survived until about 10 mya.

According to genetic studies, the Lemurs of Madagascar diverged from the lorisiforms approximately 75 mya. These studies, as well as chromosomal and molecular evidence, also show that Lemurs are more closely related to each other than to other Strepsirrhine primates. However, Madagascar split from Africa 160 mya and from India 90 mya. To account for these

facts, it is thought that a founding Lemur population of a few individuals reached Madagascar from Africa via a single rafting event between 50 and 80 million years ago. Other colonization options have been examined, such as multiple colonizations from Africa and India, but none are supported by the genetic and molecular evidence. Until recently the Aye-aye has been difficult to place within Strepsirrhini. Theories had been proposed that its family, Daubentoniidae, was either a Lemuriform primate (meaning its ancestors split from the lemur line more recently than Lemurs and Lorises split) or a sister group to all the other Strepsirrhines. In 2008, the Aye-aye family was confirmed to be most closely related to the other Malagasy Lemurs, likely having descended from the same ancestral population that colonized the island.

Suborder Haplorhini, the simple-nosed or "dry-nosed" primates, is composed of two sister clades. Prosimian tarsiers in the family Tarsiidae (monotypic in its own infraorder Tarsiiformes), represent the most basal division, originating about 58 mya. The infraorder Simiiformes emerged about 40 mya, and contains two clades, both Parvorders: Platyrrhini, which developed in South America, consisting of New World monkeys, and Catarrhini, which developed in Africa, consisting of Old World monkeys, humans and the other Apes. A third clade, which included the Eosimiids, developed in Asia but went extinct millions of years ago.

As in the case of Lemurs, the origin of New World monkeys is unclear. Molecular studies of concatenated nuclear sequences have yielded a widely varying estimated date of divergence between Platyrrhines and Catarrhines, ranging from 33 to 70 mya, while studies based on mitochondrial sequences produce a narrower range of 35 to 43 mya. It is possible that anthropoid primates traversed the Atlantic Ocean from Africa to South America during the Eocene by island hopping, facilitated by Atlantic Ocean ridges and a lowered sea level. Alternatively, a single rafting event may explain this transoceanic colonization. Due to continental drift, the Atlantic Ocean was not nearly as wide at the time as it is today. From *Britanica*,¹(2010), a small 1 kg (2.2 lb) primate could have survived 13 days on a raft of vegetation. Given estimated current and wind speeds, this would have provided enough time to make the voyage between the continents.

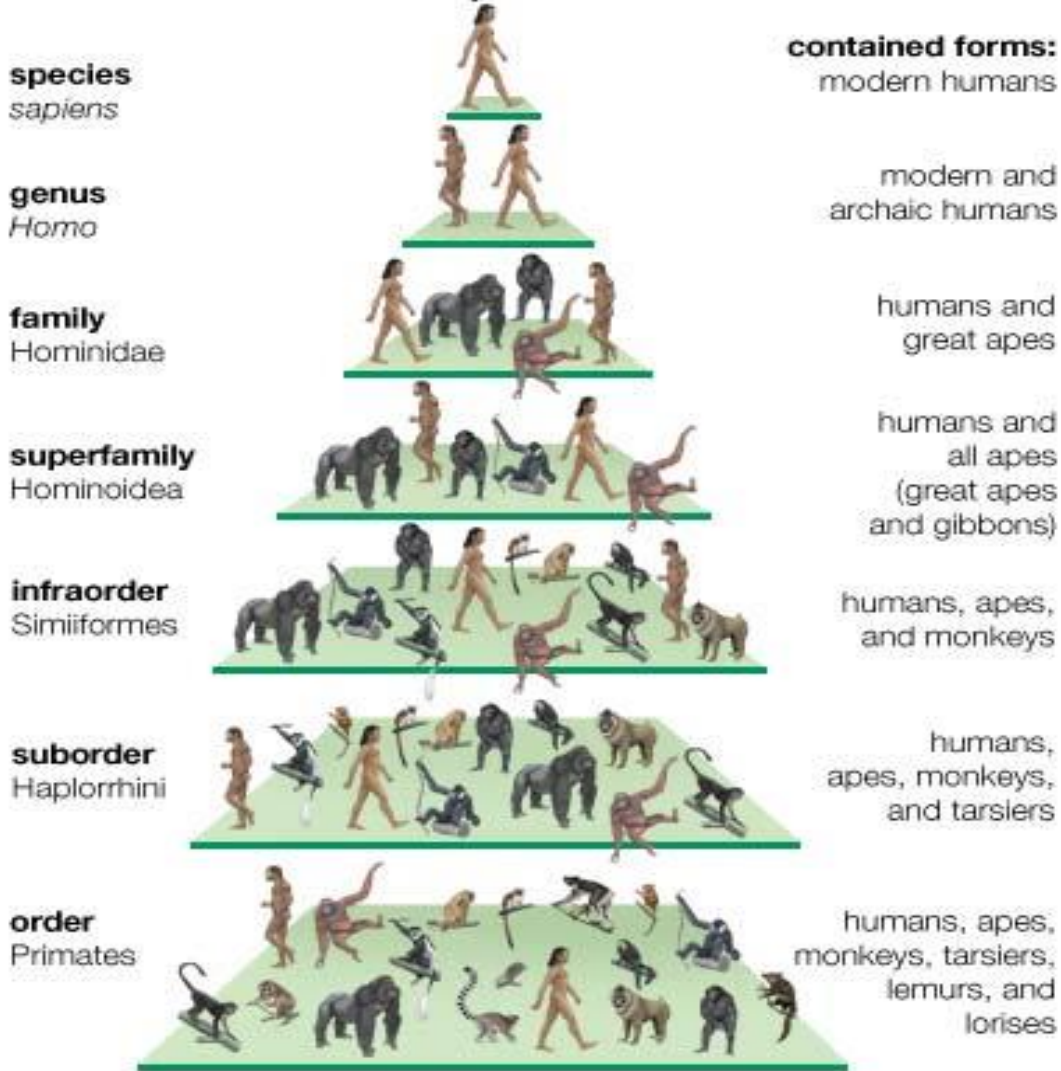
Apes and monkeys spread from Africa into Europe and Asia starting in the Miocene. Soon after, the Lorises and Tarsiers made the same journey. The first Hominid fossils were discovered in Northern Africa and date back 5–8 mya. Old World monkeys disappeared from Europe about 1.8 mya. Molecular and fossil studies generally show that modern humans originated in Africa 100,000–200,000 years ago. Although primates are well studied in comparison to other animal groups, several new species have been recently discovered, and genetic tests have revealed previously unrecognised species in known populations. Primate Taxonomist listed about 350 species of primates. Groves (2001) increased that number to 376 for his contribution to the third edition of *Mammal Species of the World (MSW3)*. However, publications since the taxonomy in MSW3 was compiled in 2003 have pushed the number to 424 species, or 658 including subspecies.

Evidence points to the rest of the primates having some relationship with the tree shrews, a small insectivorous mammal that took to the trees some 70 million years ago in the Palaeocene or the earlier Cretaceous epoch. From this little shrew-like progenitor was founded the primate order which came to dominate the animal kingdom. The charts below trace the evolution and divergence of primates. Fig. 1 chart is based on fossil finds while fig. 2 shows the divergence of the primates traced through biochemical studies as employed by Vincent (1967). The biochemical studies show the relationship among man and animals by comparing substances found in their molecules. The above authors considered the tree shrew to be a most primitive primate as can be seen by their inclusion of this animal in their charts.(Fig.1 and Fig.2)

Classification is used in biology for two totally different purposes, often in combination, namely, identifying and making natural groups. The specimen or a group of similar specimens must be compared with descriptions of what is already known. This type of classification, called a key, provides as briefly and as reliably as possible the most obvious characteristics useful in identification.

Primate Classification

Classification of *Homo sapiens* within the order Primates



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Figure 3: Evolutionary Trends of Primate Species

Order Primates has traditionally been divided into two main groupings: Prosimians and Anthropoids (Simians). Prosimians have characteristics more like those of the earliest primates, and include the Lemurs of Madagascar, Lorisiforms and Tarsiers. Simians include the monkeys,

apes and humans. More recently, taxonomists have preferred to split primates into the suborder Strepsirrhini, or curly-nosed primates, consisting of non-tarsier Prosimians, and the suborder Haplorhini, or dry-nosed primates, consisting of Tarsiers and the Simians. Simians are divided into two groups: Platyrrhine ("flat nosed") or New World monkeys of South and Central America and Catarrhine (narrow nosed) monkeys and apes of Africa and southeastern Asia. New World monkeys include the Capuchin, Howler and squirrel monkeys; Catarrhines consist of Old World monkeys (such as Baboons and Macaques), Gibbons and great apes. Humans are the only extant Catarrhines that have spread successfully outside of Africa, South Asia, and East Asia, although fossil evidence shows many other species were formerly present in Europe. Several primates have been discovered in the year 2000s. There are about 300 species of primates divided into three suborders namely: Prosimii, Tarsioidea and Anthropoids. Of these, 200 species were found predominantly in tropical regions, especially forests.

Suborder Prosimii

These are the most primitive primates (Prosimii). The name prosimian means 'before apes'. These primitive primates are the forerunners of the Monkeys and Apes. They are mostly small in size and characterized by: a nocturnal lifestyle, grooming claws as well as nails, long snouts and a wet tip, specialized scent glands, eyes slightly more to the side of the head than monkeys (but they still have good forward vision) and front teeth in the lower jaw projecting forward almost horizontally. This suborder comprises 4 families made up of Lemuridae: e.g. Lemurs, Indridae e.g., Indris, Loriscidae: e.g., Loris, Pottos, and Bush babbies (galagos), Tarsiidae: e.g., tarsiers, Daubentoniidae: e.g., Aye-aye. The Lemurs are exclusively native to Madagascar with examples like black and white ruffed lemur, ring-tailed lemur, mouse lemur, and dwarf lemur. The tarsiers were once widely distributed over most of northern hemisphere but have now dwindled to just one single living genus that is now restricted to a few Southern-East Asian islands. The loriscoids, unlike the other prosimians survived outside of Madagascar and the islands of the western Indian Ocean. These include the African galagos, the Sri Lankan slender loris, the slow loris of South-East Asia, the African pottos and angwantibo. The indris and the Aye-aye are also among the Prosimians that are native only to Madagascar.

Suborder Tarsioidea

Tarsier, common name for any of four species of primates found in Indonesia, Borneo, and the Philippine Islands that are slightly smaller than full-grown rats. Tarsiers have soft, furry bodies and slender limbs. They are brownish-gray, with large, rounded heads, the most conspicuous features of which are enormous, gogglelike eyes adapted for the animals' nocturnal life-style. The muzzle is short, and the ears are long and rounded. The hind limbs are especially modified for leaping. The fingers and toes are extremely long and are equipped with fleshy disks that provide traction. The tail is long and ends in a tuft of hair. The animals are arboreal and forage for food, usually insects and lizards, only at night. They are primarily solitary. Breeding takes place throughout the year. One species, the spectral tarsier, has olive markings on its body and black markings on its head and face. Tarsiers make up the family Tarsiidae.

Suborder Anthroidea (Simians)

The anthropoids are the higher primates made up of Monkey, Apes and Humans. Most are large in size and diurnal. There are, at least, 145 living species in this suborder and over 90 percent of them are monkeys (see Figure 3)

Monkeys

Monkeys make up two broad groups i.e., Old world monkeys (in Africa and Asia) and New world monkeys (in the Americas). The two can be easily distinguished by the differences visible on their heads and tails. The old world monkeys are characterized by tear drop-shaped nostrils pointing downwards and close together, some species have cheek pouches to carry food, tails are never prehensile, hairless callous pads on their rumps, dental formula of 2.1.2.3, while their new world monkeys are characterized by nostrils round, pointing outwards and wider apart, absence of cheek pouches, prehensile tails, i.e., tails that are capable of being used as 'third hands' for holding onto branches and supporting their bodies, bottoms completely covered with fur, and dental formula of 2.1.3.2 or 2.1.3.3 (Wikipedia, the free encyclopedia, 1912)

Old World Monkeys

Old world monkeys occupy a wide variety of environments in South and East Asia, the Middle East, Africa and even Gibraltar at the Southern tip of Spain. They are found in tropical forests, arid grasslands and even mountainous areas with heavy winter snows. There are at least, 78 species of old world monkeys in two subfamilies-Cercopithecinae and Colobinae.

Cercopithecinae group

Most of the old world monkeys which belong to this subfamily include Macaques, Mandrills, Mangabeys, Patas monkeys, Baboons, and Guenons. With the exception of the macaques which also live in Gibraltar and Asia, the rest are African species. The cercopithecine group shares two identifiable anatomical features as Ischial callosities which are bald pads of skin on the bottom of the primates and cheek pouches that expand to allow and secure temporary storage of food.

Colobinae groups

The colobinae group includes the colobus monkeys of Africa, the South Asian langurs and the proboscis monkeys. These are all herbivores, unlike the Cercopithecinae, which are more omnivorous in their diet. The colobines are characterized by the lack of cheek pouches, presence of sacculated stomachs, that is., their stomachs 'sacculi', or sac like compartments in which bacteria and usual combination of enzymes breakdown cellulose, thereby providing more usable calories, unusually long intestines that increase the absorption of nutrients, and stomachs which contain more acid than do other monkeys.

New World Monkeys

These monkeys live within the primate habitat ranges in the tropical regions of the Americas. All new world monkeys are fairly small and exclusively tree dwelling. The new world monkeys are divided into two families: the Callithricidae and the Cebidae. The Callithricidae are the most primitive monkeys and comprises the Marmosets and Tamarins. The Cebidae are largest and also the only primate that have prehensile tails. Examples of Cebidae are squirrel monkeys, capuchins, spider monkeys, woolly monkeys, sakis, uakaris, night monkeys, titi monkeys, and howler monkeys. Apes are grouped into 'lesser' and 'great' apes. The lesser apes include Gibbons and Siamangs while the great apes are orangutans, Bonobos, Chimpanzees, Gorillas, and Humans. Apes are characterized by absence of tails, longer arms than legs, very flexible wrists, and barrel-shaped chests. Siamangs, Gibbons, and Orangutans are of Asian origin while Chimpanzees and Gorillas are of African origin.

Primate values

Raising local primates can have great economic returns when the species are traded. For example, the monkey industry began in 1984 in Mauritius and grew to become the biggest livestock industry in the country in terms of export earning (over 100 million Rands per annum). Alongside the booming industry was the provision of 220 direct employment for the people (Stanley & Griffiths, 1997). On the tourism side the economic value of primates can also be appreciated in the light of the income that wildlife sanctuaries generate. Being close relative to man, studies on their anatomy and physiology have proved useful. For example, facts about human blood chemistry and disease prevention have been revealed by studies on Rhesus Monkeys.

Primates and Tree Felling

Primates are among the species that are declining due to the direct effect of tree felling. The clearance of some areas around the park for agricultural purposes is rampant, often encouraged by increased access along logging roads. The fact that logging stimulates hunting and wildlife trade is usually poorly addressed and commercial hunting of primate, especially in logging concession, threatened their existence. Ammann's investigation of hunting pressure in and outside the International Union for Conservation of Nature and Natural Resources surveyed areas strongly indicates that unprotected and unstudied apes are being destroyed by a burgeoning commercial bushmeat trade (1993, 1996a). The primary catalyst of this destruction is the growth of the timber industry (Ammann, 1996b; Pearce & Ammann, 1995).

Control hunting in park areas subject to logging is especially complex because of the many different players such as local people, logging employees, and other hunters, and the associated social, cultural and economic change brought about by the logging activity. While the effects of logging on primates are deleterious, the indirect impacts of logging resulting from increased access into the park often far outweigh the initial damage done by even the worst predatory animals (Francis et al., 2000).

Primate hunting

Hunting of wildlife is sustainable when harvest does not exceed the reproductive rate of the animals. The production rate is determined by the density or numbers of animals, and the reproductive rate of the average individual animal. Harvest rate of wildlife is driven by the demand of the consumers, and controlled by taboos, rules, regulations, enforcements and incentives. Hunting is already a global threat to primates (Mittermeier, 1987). A growing body of evidence shows that shifts in human social and economic practices in forests of Africa has greatly increased the killing of primates for meat and Oates (1996a) observed that analysis of survey data suggests that human predation tends to have greater negative impact on primate populations than does selective logging or low-intensity bush-fallow agriculture. According to Oates et al., 2006, hunting by humans appears to be the ultimate cause of the extinction of Waldron's red colobus monkey, *Procolobus badius waldroni*, a primate taxon endemic to the West African forests of Ghana and Cote d'Voire.

In West and Central Africa commercial hunting is a leading threat to the survival of primates, including the great apes. For example, in 44 primate studies and conservation projects described in IUCN's recent status survey on African primates, primate hunting is reported in 27 of them and in 12 of these, hunting by humans is listed as a severe threat to their survival (Oates, 1996b). The bush meat trade has emerged as the direct result of increase in the growth of industrial extractive commerce in the economically poor region of Africa as most contemporary Africans are losing their traditional theistic reverence for wildlife and taking on the utilitarian view (Mordi, 1991). This has stretched all the way from the bush to the cities where more rare and expensive fare is available. Gorillas, Chimpanzee, and Elephants are among the animals that are slaughtered in timber concessions and sold their meat at prices ranging from two to six times the cost of the beef or pork that is readily available to consumers in larger towns and cities (Rose, 1998). Monkeys are a serious pest to agriculture by attacking and damaging most types of crops. This also contributes to their intensely being hunted for in agricultural areas in addition to the bushmeat crises they already face.

Need for Primate Conservation

The International Union for Conservation of Nature and Natural Resources,(IUCN) formerly called World Conservation Union (WCU) surmised that, threatened animals showed a large increase in threat status of mammal species, with primates being the most threatened by extinction (IUCN, 1996). As a matter of fact, all forest living primates may be considered endangered because tropical forests are being destroyed at a high rate, more especially so, those that have slow reproduction rate. Nigeria, for example, has lost most of its forest primate habitats and some primate species now have only isolated fragments remaining through their entire range. All the Guenons in Nigeria are declining as a result of habitat loss through Agricultural expansion, logging, and intensive hunting. The IUCN classifies the following Nigerian Guenons as endangered: *Cercopithecus preussi*, *C. sclateri*, *C. erythrogaster* and *C. erythrotis*, *C. sclateri* is one of the most endangered primates in all of Africa and it is endemic to Nigeria.

The IUCN also classified the red-capped Mangabey as vulnerable. They are now locally extinct in some isolated patches of swamp forest in the Niger delta and extremely rare in other areas of their habitat range and particularly vulnerable to hunting because of its large size and

value as bush meat. The grey-checked mangabey has not been seen for many years in Nigeria and it is feared that it may already have become locally extinct.

The Western lowland Gorilla living in the Nigerian-Cameroon border is known to be critically endangered. Lists of endangered primates now include lemurs in Madagascar, Tamarins in Brazil, Langurs in Vietnam, *Sumatran orangutans*, Gorillas and a variety of Monkeys. Recent extinctions of primates have not been with notice. From www.wikipedia.com, surveys in Ghana and Cote d'Ivoire from 1993-1996 revealed that Waldron's red colobus monkey, *Procolobus boadius waldroni*, which is endemic to this part of West Africa has gone into extinction (Oates et. al., 2006).

In the face of much fragmentation of forests by logging, road and building construction which create isolated islands of primates that are being systematically trapped and shot by hunters, the disappearance of Waldron's red colobus monkey will most likely turn out to be the first obvious primate extinction in recent times. This will soon be followed by a series of other extinctions if measures are not taken to reverse this trend towards primates' extinction.

Primate Surveys

Primate census surveys are useful because their population density estimates are important variables when considering conservation priorities and creating management plans for primate populations (Ganzhorn et al., 1997). These surveys are also valuable to researchers trying to understand socio-ecological differences between primate populations (Butynski, 1990).

West African diurnal Primates

Diurnal primates native to West Africa are the Apes and Monkeys. The Apes are made up of Western lowland Gorilla and Chimpanzee. The Western lowland Gorilla is found in the tropical rainforests of Cameroon, Gabon, Central African Republic, Equatorial Guinea, Cabinda (Angola), and the Republic of Congo (Brazzaville). They can weigh up to 210 kg. A sub species of western lowland gorilla lives in the border area of Nigeria and Cameroon (Cross River). The Chimpanzee. (*Pan troglodytes*) are found in savannah woodlands, grassland-forest mosaic and tropical moist forests, from sea level to about 3,000m elevation.

The Monkeys are made up of Patas monkey. (*Erythrocebus patas*) which inhabit acacia woodland and dry savannah ranging from West Africa to Ethiopia, Kenya, and Tanzania . The patas long slender limbs, the back and sides are reddish brown and the under-parts are grey/white. They have white moustache and the face varies from black to light grey. They have shaggy, grey-streaked shoulders with the males have a bright blue scotum. The Grey-cheeked mangabey (*Lophocebus albigena*) ranges from West Africa to Uganda, North of the Congo River. Their vocalization is whoop-gobble.

The Vervet monkey or Green monkey (*Cercopithecus pygerythrus*) is found from the Southern Sahara to the whole Southern part of the African continent, except in the rain forests. They vary in colour, but generally the body is a greenish-olive or silvery grey. The males are easily recognized by their turquoise blue scrota. The Red Colobus (*Piliocolobus badius*) is an obligatory arboreal species which depends on nature forests. They are found in parts of Uganda and Tanzania and Western Africa. They differ from other colobus species as their fur is of even length over the whole body, with no tufts of longer hair.

The Mona monkey (*Cercopithecus mona*) are brightly coloured, loud, and noisy small Guenons found in a variety of forest types from mangrove swamps to gallery forests and woodlands. Their most distinctive marks are two bold white spots on their hips, long thick sideburns and white long tufts on the ears. They are both arboreal and terrestrial and move through the forest quadrupedally. Their vocalizations are boom calls and back calls. They are found in tropical South-West Africa from Ghana to Cameroon.

Greater white-nosed or putty nosed monkey (*Cercopithecus nititans*) is a forest Guenon species that has its range running from Guinea to Congo and Zaire and North of the Congo River. The White-throated or red-bellied guenon (*Cercopithecus erythrogaster*) is a forest Guenon species that is native to Eastern Benin and Western Nigeria. The Preuss's Guenon (*Cercopithecus preussi*) is a forest guenon species that is native to South-eastern Nigeria, and Cameroon. The Red-eared Guenon (*Cercopithecus erythrotis*) is a forest Guenon species that is native to South-Eastern Nigeria and South-Western Cameroon. The Sclater's guenon (*Cercopithecus sclateri*) is endemic to South-Eastern Nigeria between the Niger and Cross Rivers. The Crowned Guenon (*Cercopithecus pogonias*) is a forest guenon species that ranges from South-Eastern Nigeria through Cameroon, Equatorial Guinea, Gabon to North-Western Zaire. Red-capped or white-collared Mangabey (*Cercocebus torquatus*) is a large partially terrestrial species found only within approximately 200 km of the coast in areas of high rainfall enjoying a wide range of habitats from swamp forest to Agricultural areas. This Mangabey is found distributed from Senegal through West Africa up to Congo.

Scientific classification:

Kingdom: *Animalia*
Subkingdom: *Metazoa*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Superclass: *Tetrapoda*
Class: *Mammalia*
Subclass: *Theria*
Infraclass: *Eutheria*
Order: *Primates*

METHODS

Study Area

Old Oyo National Park is one of the seven National Parks in Nigeria that was created by Decree 46 of 1999. The park covers a land area of approximately (2,512) sq.km-making it the fourth largest park in Nigeria after Gashaka Gumti (6,731) sq.km, Kainji Lake (5,340.82) sq. km, Cross River 4000 sq. km. Others are Chad Basin 2, 258 sq. km, Kamuku 1,121 sq. km, Okomu 202 sq. km, shape like a saxophone. The park is about 120km long from the Southwest to the Northeast and about 50km at its widest in the South. The purpose was mainly for conservation, preservation and protection of our natural resources. It also contained historical resources from Old Oyo Empire. The Motto of the park is "Blending of our glorious park with nationhood". The park has five ranges which are: Marguba range in Sepeteri, Oyo Ile in Igbeti, Yemoso in Ikoyi-

Ile, Tede Park in Tede and Sepeteri range in Igboho. Old Oyo National park like most other parks in Nigeria needs increased protection if it is to be sustained into the future. It provides a thriving habitat for a range of wild fauna among which are primates which inhabit the guinea trees but the wildlife component has not yet been well researched. Old Oyo National Park is located in Oyo State in southwest of Nigeria. It lies between North Latitude $008^{\circ} 10' N$ - $009^{\circ} 5' N$ and Longitude $003^{\circ} 0' E$ $004^{\circ} 20' E$, the two nearest National Parks are Kainji Lake and Kamuku National Parks. The park is approximately 300km from Lagos, 60km from Ibadan, 160km from Ilorin, 660km from Abuja, 660km from Kaduna and 910km from Kano. The study area and its vegetation are shown in figures 4 and 5 respectively. A network of fairly tarred roads surrounds the park, making it possible to reach with relative ease. Travellers from eastern part of Nigeria and Lagos/Ibadan axis can come in through Ibadan-Iseyin-Sepeteri to enter the park through Ajaku gate. Travellers from Abuja, Kaduna-Kano axis can come in through Ilorin-Igbeti to enter the park through Jokoro. Tessa Garuba or Apata routes. Those from Kainji Lake can come in through Kaiama Kishi-Soro to enter the park through Soro gate, while those travelling from Central Benin Republic can come in through Yashikira Kosubosu-Igboho to enter the park through Alagutan route.

Climate and Weather

Annual rainfall in the park is between 900mm and 1,500mm, and main annual temperature is between $12^{\circ}C$ and $37^{\circ}C$. The rainy season begins in April through September, with the highest rainfall record between July and August. The dry season begins in October through early April and driest and hottest period is between November, December, February through March. During this time, night temperatures are quite low.

Topography and Drainage

Most part of Old Oyo National Park are lowlands plains, undulating from 300m to 500m above sea level. Few hills, notable Yemoso and Gbogun, however rise several meters above their general surroundings. The greater part of the park is watershed and is well drained by two river systems; the Ogun river flowing Southwards to the Atlantic Ocean, and the Tessa river flowing Northwards to the River Niger. Several tributaries flow South-Westward, and Eastward, and North-Westwards to join these two main rivers respectively.

Project design

The present study had been designed as shown in the flow chart of figure 6

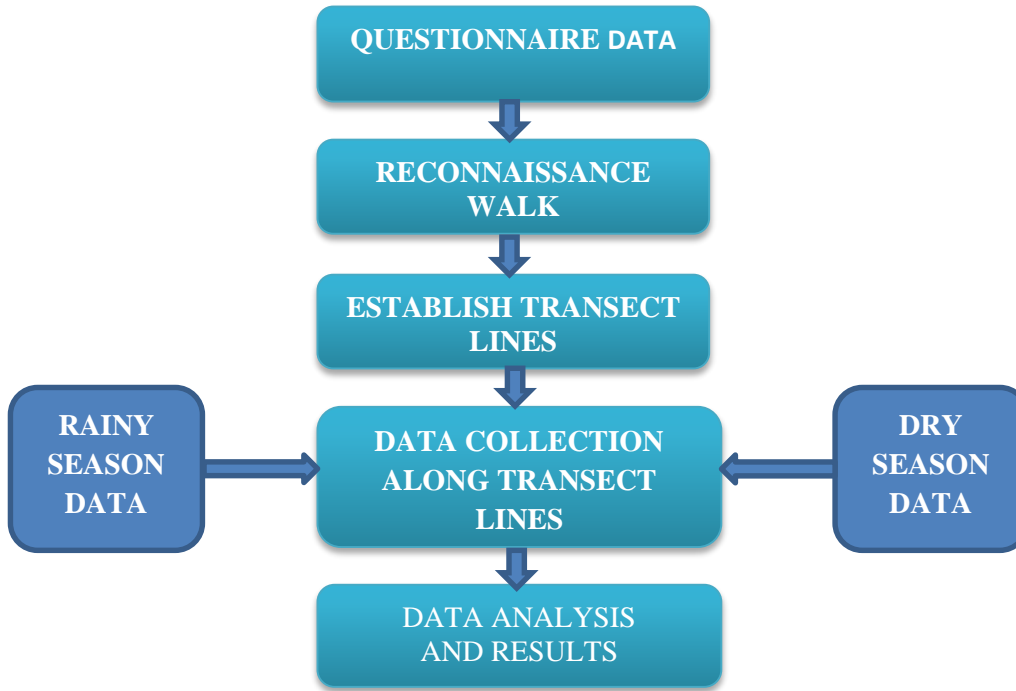


Figure 6: Flowchart illustrating the project design.

Line Transect

The research methodology used for this survey is the transect method. A transect is a defined area in which sample population counts can be taken. The area has to be large enough to truly characterize the biotic and abiotic factors being studied in the ecosystem. Currently, there is a general agreement that line transect surveys are the most efficient methods for surveying most species (Plumptre and Cox, 2006). These surveys have the advantage of providing information on primate distribution and abundance in a relatively short period (Struhsaker, 1981).

The line transect involves walking a straight path usually located at random through a representative sample, of the park and recording specific information on the primates encountered. It will be repeated a number of times until analysis shows that results obtained will not vary significantly with further transects. The line transect sampling is used to obtain an estimate of primate density which can then be converted to a population density by multiplying the density from the sampled area by the total area being surveyed.

Preparation of Transect Lines

A reconnaissance walk was first made by walking in as straight a line through the park (Walsh & White, 1999) with an experienced ranger who knows the park very well as a guide. This was to

get a picture of what the park looks like. The park was mostly heterogeneous with native trees except for farmlands and plantations, e.g., Teak, *Gmelina*, and also of food crops like Cassava, Yam and Corns.

The criteria for establishing transects were that each had to pass through representative area of the park (i.e. sample the entire habitat types in the park). Transect 1 was in river area where the animals came to drink water; Transect 2 was in an area where the animals came to lick salt; Transect 3 was in an area that was close to farmlands; Transect 4 was in an area where the animals used to play, here, we have a concentration of tall trees with much branching; Transect 5 was in an area where there were rock, abandoned paths were also used as transects.

Transects were located from arbitrarily selected reference points. The transect lines were marked out at random by making a straight path of between 3 and 6 km long through the park using a compass bearing. Each transect was divided along its length into sub-units of 100m and marked out with brightly coloured tapes for easy measurement of the distance, primate groups were spotted from the beginning of the transect lines. The lengths were derived by the slow walking speed of 1–1.5km/hr.

Walking the Transects

Transect were walked as quietly as possible between the hours of 0630-1100 and 1500-1830 hours when primates are notably most active and therefore easier to detect (Butyls and Mwangi, 1994). No transect was walked on two consecutive days. This was to avoid disturbances that could be caused by frequent movements along the transects. They were walked at a speed of about 1.5km per hour, making frequent stops to look at sightings and listen for primate vocalizations.

Data Collection

Data collection was first made by visiting the staffers in Akoto in Sepeteri, Igbeti and Ikoyi-Ile, all on the outskirts of the park, using questionnaires (See Appendix 1). These questionnaires were to collect information from rangers and poachers and some hunters living very close to the park. Among these hunters only one has been hunting in the park for less than ten years, seven has been hunting for between eleven to twenty years, five have been hunting for between twenty one to thirty years, and three for more than thirty one years. To ensure correct identification of the primates, full coloured pictures of primates likely to be found in the eco-region were used to assist the hunters' identification of the primates they encounter in the reserve.

The strip census method which utilizes sighting distances is used here. This method is particularly useful in rough terrains where compass line courses are difficult if not impossible to follow. So the sighting distances can be measured from a meandering course as easily as from a straight line (Robinette *et al.*, 1974).

Observations were made while walking along the transects, watching, listening and recording the number of primate groups seen and some measure of the distance from observer to the primates. These observations were made usually to see whether groups are bisexual, an all-male band, or mixed species, or even solitary individuals. Different species were identified both visually and vocally with the help of a ranger guide who is well acquainted with the primates. Whenever a primate group is observed, information about the group is collected and entered into the data sheet (See Appendix 1). Only animals seen and counted while walking the transects are

used in the 'subgroup' size. Care was taken to ensure that no group was counted twice. This number is used to estimate primate density (Laake et al., 1994). The data collected along the transects were done in both rainy and dry seasons. Each transect was walked twice in June to October, 2011 (rainy season), twice from November, 2011 to March, 2012 (dry season).

Data Analysis

Assumptions Made in Calculating Densities

There were six basic assumptions summarized below by Dunn (1993):

1. Animals positioned directly over the transect lines are not missed. It is also understood that not all the animals within the survey area are detected; some invariably are missed and the probability of detection declines with increasing distance from the transect line.
2. Animals or social groups are seen before they flee, none are counted twice. Any behavioural response by the animal to the presence of the observer does not affect sighting distances i.e. the positioning of the group determined before they move away.
3. The sighting of each animal (or group) is independent of sighting of other animals or groups
4. All group animals are distributed at random with respect to the transect
5. The behaviour of groups do not vary with location along the transect. Species-specific behaviour is constant relative to the observer.
6. Behaviour of groups is species-typical (i.e. the response of a group to observers is the same as that of other groups of the same species regardless of group size or composition) and does not affect detectability with increasing distance from the transect, or between survey areas.

Estimations

Fashing and Cords (2000) have found that the observer to animal distance method by Struhsaker (1981) was reliable when tested on animal sights for which 'true' primate density values are available for comparison in which it provided relatively accurate results. This method is also preferable when mean group spread cannot be reliably determined, for example, in a thick bushy area. Struhsaker (1981) maximum reliable observer to animal distance method formula for calculating group density used here is given by:

Absolute densities—sum of groups sighting per square kilometre of transect.

(Sum of group sightings refers to the total number of groups sighted at a distance equal to or smaller than the fall-off distance). The fall-off distance was described as the influence of the movements of the eyes in the estimation of length was emphasized by Helmholtz. An accurate comparison of the lengths of two parallel lines AB and CD can be made, whereas if an attempt is made to compare the nonparallel lines $A'B'$ and $C'D'$, quite large errors occur. According to Helmholtz, the eye fixates first the point A , and the line AB falls along a definite row of receptors, thereby indicating its length. The eye is now moved to fixate C , and if the image of CD falls along the same set of receptors the length of CD is said to be the same as that of AB .

Such a movement of the eye is not feasible with lines that are not parallel. Similarly, the parallelism, or otherwise, of pairs of lines can be perceived accurately because on moving the eye over the lines, the distance between them must remain the same.

Fairly accurate estimates of relative size may be made, nevertheless, without movements of the eyes. If two equal lines are observed simultaneously, the one with direct fixation and the other with peripheral vision, their images fall, of course, on different parts of the retina; if the images were equally long it could be stated that a certain length of stimulated retina was interpreted as a certain length of line in space. It is probable that this is roughly the basis on which rapid estimates of length depend, although there are such complications as the fact that the retina is curved so that lines of equal length in different parts of the retina do not produce images of equal length on the retina.

Relative abundance indices – average numbers of primate groups encountered per kilometer of transect. The transect width estimator used is the maximum reliable distance from observer to animal (reliable distance to animal method) (Struhsaker, 1981). The area sampled is calculated as $\text{Transect Area} = \text{transect length} \times \frac{1}{2} \text{transect length (width)}$. The computer program used to perform calculations for comparing the relative abundance among the species and the diversity between the transects is Palaeontological Statistics software (PAST).

The period of study was between March, 2011 to March, 2012. The study was carried out both in the morning and in the evening, the period covered rainy and dry seasons. The transect were placed along the following route:

Tede/Sepeteri (Marguba) range:

- (i) Along salt licking area (Aho) = 3.3km (Plate 1)
- (ii) Along the Ibuya river = 4.0km (Plate 2 and 3)
- (iii) A place where they normally meet = 6.0km (Plate 4 and 5)
- (iv) Very close to the farmland = 3.5km(Plate 6)

Igboho/Oyo-Ile range:

- (i) Along the river (Weke river) = 3.0km
- (ii) Very close to the hill = 5.0km (Plate 7)
- (iii) Close to the farmland = 3.0km

Yemoso (Ikoyi-Ile) range:

- (i) Along the hill (Oke gbogun) =4.0km
- (ii) Along the river (Oowe river) =3.6km
- (iii) Close to the farmland =3.2km

Total transect distance in kilometer was =38.6km

$\text{Transect Area} = \text{transect length} \times \frac{1}{2} \text{transect length (width)}$

Total length of the transects in the five ranges = 38.6km

$\frac{1}{2} \text{transect length (width)} = 19.3\text{km}$.

The total area sampled = 744.98 sq. km

The total area of the park=2,512 sq.km

A Radar-like post for observing the animals was placed in the park at Akoto area; it can also be used to detect poachers who entered the park illegally to kill the animals (Plate 8).



Plate 1: A transect line placed at where they normally lick salt



Plate 2: Ibuya River in Akoto where transect line was placed



Plate 3: An open space close to Ibuya River



Plate 4: Another spot where transect line was placed, here, there were concentration of tall trees (*Margaritaria discoideus*)

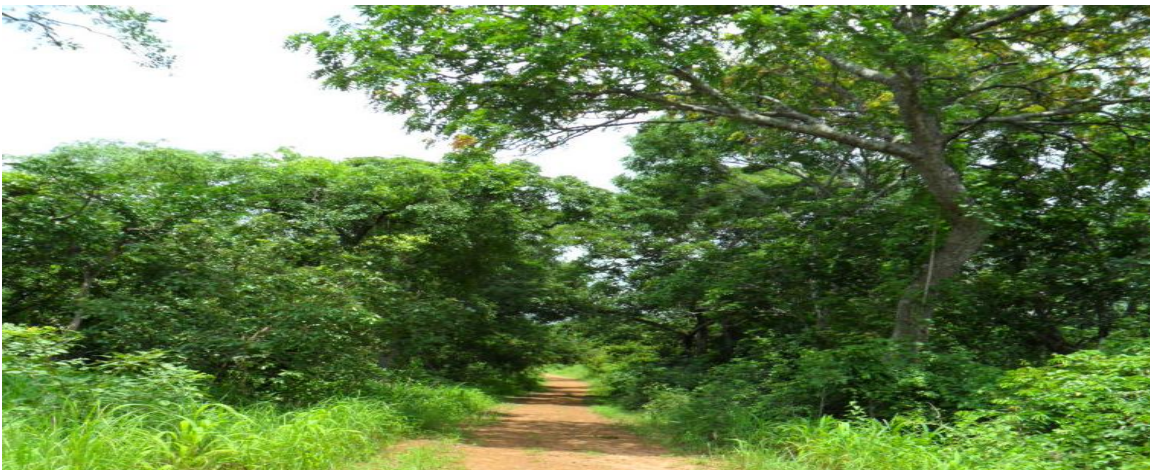


Plate 5: Another spot where the transect line was placed



Plat 6: A place closed to the farmland



Plate 7: Transect placed very close to the hill



Plate 8: A radar-like post placed in the park at Akoto for observing the animals

RESULTS AND DISCUSSION

Primate Presence through Hunters' Responses

From the questionnaire survey with the hunters, before the transect walks, it was gathered that there were presently eight primate species in the Old Oyo National Park. All the eight primate species were Monkeys and Baboons. These include Red monkey (*Erythrocebus patas*), Green monkey (*Chlorocebus sebaeus*), Tantalus monkey, Ash coloured monkey (*Tataras monkey*), White throated monkey (*Cercocebus erythrogaster*), Green colobus (*Colobus satanas*) and Putty-nosed monkey (*Cercopithecus nititans*) and Baboon (*Papio anubis*). These were the primates species they had observed in the Old Oyo National Park except the Gorilla (*Gorilla gorilla*) and Chimpanzee (*Pan troglodytes*) which were never seen in the last forty years. All the hunters confirmed the presence of Baboon (Plate, 9, 10 and 11) and the Red monkey (Plate 12). Eight of them confirmed the presence of Tantalus and Green monkey (plate 13).

Primate presence through direct observation

During the transect walks however all these species were encountered except during the rainy season, when the Green colobus and Putty-nosed monkey (*Cercopithecus nititans*) were not seen at all. This confirmed the report of eight out of the twenty hunters to which the questionnaires were administered. One of the hunters however reported having encountered a pair of chimpanzees (a male and a female) twice in 2009 and once in 2011 when the male alone was sighted. The observations were made close to the border between Nigeria and Benin Republic. There were no encounters with chimpanzees and the Gorilla while walking through the park.

Primate Populations

Transect Area

Initial reconnaissance transect walks revealed that the primates were only concentrated within a limited area due to anthropogenic influences, hence the total sampled area was less than the total area of the park.



Plate 9: Baboon and its young sitting on a rock in Oyo-ile range



Plate 10: A Baboon carrying its baby in Marguba range



Plate 11: Troops of Baboon in Oyo-ile range



Plate 12: *Erythrocebus patas*



Plate 13: *Erythrocebus sebaeus*

Number of Primate Species in the Park

Table 1: Total number of Primate species in Old Oyo National Park sighted between two and eleven times.

Common Name	Species	Total No.
Red monkey	<i>Erythrocebus patas</i>	201
Green monkey	<i>Chlorocebus sebaeus</i>	80
Tantalus monkey	<i>Tantalus sp.</i>	22
Tataras monkey	<i>Tataras sp.</i>	54
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21
Baboon	<i>Papio anubis</i>	438
Green colobus	<i>Colobus satanas</i>	41
	Total =	900

Table 1 showed that Baboon (*Papio anubis*) had the highest population with a total number of 438; followed by Red monkey (*Erythrocebus patas*), 201; Green monkey (*Chlorocebus sebaeus*) which was 80; *Tataras sp.* 54; *Cercopithecus erythrogaster* 43; Green colobus (*Colobus satanas*) 41; *Tantalus sp.* 22 and *Cercopithecus nititans* 21.

Primate composition in Old Oyo National Park

Table 2: The percentage composition of the Primate species in Old Oyo National Park

Common Name	Species	Total No.	% Composition
Red monkey	<i>Erythrocebus patas</i>	201	22.33
Green monkey	<i>Chlorocebus sebaeus</i>	80	8.88
Tantalus monkey	<i>Tantalus sp.</i>	22	2.45
Tataras monkey	<i>Tataras sp.</i>	54	6.00
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43	4.78
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21	2.33
Baboon	<i>Papio Anubis</i>	438	48.67
Green colobus	<i>Colobus satanas</i>	41	4.56
	Total =	900	100

Table 2 showed that total number of 900 primates were censused on the 10 transects used. Baboons (*Papio anubis*) were the commonest accounting for 48.67% (N=438) of the total number of primate species. The Red monkey (*Erythrocebus patas*) were also frequent in the censuses accounting for 22.33% (N=201) of total species. The Green monkey (*Chlorocebus sebaeus*) had 8.88% (N=80) of the species. Tataras monkey had 6.00% (N=54) of the total species. White throated monkey (*Cercopithecus erythrogaster*) had 4.78% (N=43) while Green colobus had 4.56% (N=41) of the total groups. *Tantalus sp.* had 2.45% (N=22) of the total groups and lastly Putty-nosed monkey (*Cercopithecus nititans*) had 2.33% (N=21) of the total species which was the least.

Mean Number of Primate Species in Old Oyo National Park

Table 3: The mean numbers of Primate species encountered in the Park along the transect lines

Common name	Species	Total No.	No. of sightings	Mean No. \pm S.E
Red monkey	<i>Erythrocebus patas</i>	201	10	20.10 \pm 0.68
Green monkey	<i>Chlorocebus sebaeus</i>	80	5	16.00 \pm 0.71
Tantalus monkey	<i>Tantalus sp.</i>	22	11	2.00 \pm 0.00
Tataras monkey	<i>Tataras sp.</i>	54	5	10.80 \pm 0.97
White-throated monkey	<i>Cercopithecus erythrogaster</i>	43	6	7.17 \pm 0.31
Putty-nosed monkey	<i>Cercopithecus nictitans</i>	21	5	4.20 \pm 0.67
Baboon	<i>Papio anubis</i>	438	11	39.82 \pm 1.47
Green colobus	<i>Colobus satanas</i>	41	2	20.50 \pm 15.51
	Total =	900	55	

Table 3 showed that *Papio anubis* had mean of 39.82 \pm 1.47; Green colobus had mean of 20.50 \pm 15.51; followed by Red monkey 20.10 \pm 0.68. Next to it was Green monkey 16.00 \pm 0.71; Tataras monkey 10.80 \pm 0.97. This was followed by White throated monkey 7.17 \pm 0.31 and next to it was Putty-nosed monkey 4.20 \pm 0.67 while Tantalus monkey had the least 2.00 \pm 0.00.

Absolute densities of the Primate species in Old Oyo National Park

Table 4: The absolute densities of the Primate species

Common Name	Species	Mean No. \pm S.E	Sighting Rate (per km)
Red monkey	<i>Erythrocebus patas</i>	20.10 \pm 0.68	0.52
Green monkey	<i>Chlorocebus sebaeus</i>	16.00 \pm 0.71	0.41
Tantalus monkey	<i>Tantalus sp.</i>	2.00 \pm 0.00	0.05
Tataras monkey	<i>Tataras sp.</i>	10.80 \pm 0.97	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	7.17 \pm 0.31	0.19
Putty-nosed monkey	<i>Cercopithecus nititans</i>	4.20 \pm 0.67	0.11
Baboon	<i>Papio anubis</i>	39.82 \pm 1.47	1.03
Green colobus	<i>Colobus satanas</i>	20.50 \pm 15.51	0.53

Table 4 showed that the sighting rate was the frequency at which the primate species were crossing the transect lines. This table also shows the abundance of some species having a sighting rate of above 0.5 per km while some were having much less than 0.5 which means they had become threatened or endangered.

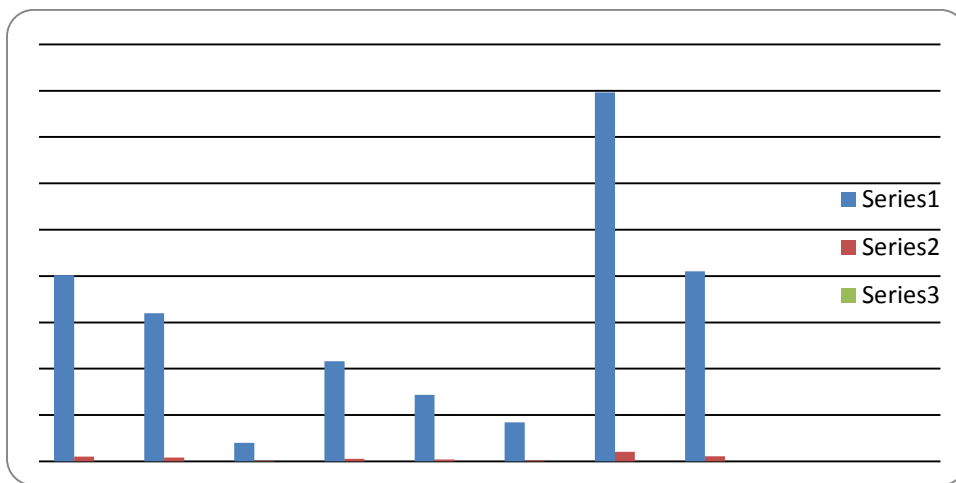


Figure7: Variation in the mean sighting rate per km of eight Primate species

Series 1. Represent the Mean No. \pm S.E

Series 2. Represent the Sighting Rate per km while

Series 3. Represent the Standard Error

1-Red monkey; 2-Green monkey; 3-Tantalus monkey; 4-Tataras monkey; 5-White throated monkey; 6-Putty nosed monkey; 7-Baboon; 8-Green colobus.

The fig.7 above showed that Baboon was sighted most. Next to it was the Green colobus and followed by Red monkey. This was followed by Tataras monkey, White-throated monkey and Putty –nosed monkey. Tantalus monkey was the least sighted during the study.

The threatened Primate species in Old Oyo National Park

Table 5: Four threatened Primate Species in Old Oyo National Park

Common Name	Species	Sighting Rate(per km)
Tantalus monkey	<i>Tantalus sp.</i>	0.05
Tataras monkey	<i>Tataras sp.</i>	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	0.19
Putty-nosed monkey	<i>Cercopithecus nititans</i>	0.11

Table 5 above showed that *Tantalus sp.* had 0.05 sighting rate per km; *C. nititans* had 0.11 sighting rate per km; *C. erythrogaster* 0.19 sighting rate per km and *Tataras sp.* had 0.28 sighting rate per km. From the result above, all these species were becoming endangered and if care is not taken, they will soon become extinct.

Seasonal variation in the number, mean and number of sighting of Primate Species in Old Oyo National Park

Table 6a: The mean of the total Primate species in Old Oyo National Park in Rainy seasons from April-October 2011.

Common Name	Species	Rainy season		
		No. of Primate species	No. of sightings	Mean \pm S.E
Red monkey	<i>Erythrocebus patas</i>	103	06	17.17 \pm 0.65
Green monkey	<i>Chlorocebus sebaeus</i>	66	04	16.50 \pm 0.65
Tantalus monkey	<i>Tantalus sp.</i>	16	08	2.00 \pm 0.25
Tataras monkey	<i>Tataras sp.</i>	32	03	10.67 \pm 1.34
White-throated monkey	<i>Cercopithecus erythrogaster</i>	23	03	7.67 \pm 0.34
Putty-nosed monkey	<i>Cercopithecus nititans</i>	00	00	0.00
Baboon	<i>Papio anubis</i>	274	07	39.14 \pm 1.16
Green colobus	<i>Colobus satanas</i>	00	00	0.00

Table 6a above showed the mean of the total Primate species in Old Oyo National Park in Rainy seasons from April-October 2011. *Papio anubis* had the highest number, this was followed by *Erythrocebus patas*, *Chlorocebus sebaeus*, *Tataras sp.*, *C. erythrogaster*, *Tantalus sp.* and lastly were *C. nititans* and *Colobus satanas* with zero value.

Table 6b: The Mean of the Total Primate Species in Old Oyo National Park in Dry Seasons from November, 2011-March 2012.

Common Name	Species	Dry Season		
		No. of Primate Species	No. of Sightings	Mean \pm S.E
Red monkey	<i>Erythrocebus patas</i>	98	04	24.50 \pm 0.65
Green monkey	<i>Chlorocebus sebaeus</i>	14	01	14.00
Tantalus monkey	<i>Tantalus sp.</i>	06	03	2.00 \pm 0.00
Tataras monkey	<i>Tataras sp.</i>	22	02	11.00 \pm 1.00

White-throated monkey	<i>Cercopithecus erythrogaster</i>	20	03	6.67 ± 0.34
Putty-nosed monkey	<i>Cercopithecus nititans</i>	21	05	4.20 ± 0.71
Baboon	<i>Papio anubis</i>	164	04	41.00 ± 0.32
Green colobus	<i>Colobus satanas</i>	41	02	20.50 ± 4.51

Table 6b showed the mean of the total Primate species in Old Oyo National Park in dry seasons from November,2011-March,2012. *Papio anubis* had the highest number, this was followed by *Erythrocebus patas*, *Colobus satanas*, *Tataras sp.* *C.nititans*, *C.erythrogaster*, *Chlorocebus sebaeus* .*Tantalus sp.* had the least.

Table 6c: The absolute densities of the Primates species in Rainy and Dry seasons

Common Name	Species	Rainy season		Dry season	
		Mean ± S.E	Sighting Rate(km ⁻¹)	Mean ± S.E	Sighting Rate(km ⁻¹)
Red monkey	<i>Erythrocebus patas</i>	17.17 ± 0.65	0.44	24.50 ± 0.65	0.63
Green monkey	<i>Chlorocebus sebaeus</i>	16.50± 0.65	0.43	14.00 ± 0.00	0.36
Tantalus monkey	<i>Tantalus sp.</i>	2.00 ± 0.25	0.05	2.00 ± 0.00	0.05
Tataras monkey	<i>Tataras sp.</i>	10.67 ± 1.34	0.28	11.00 ± 1.00	0.28
White-throated monkey	<i>Cercopithecus erythrogaster</i>	7.67 ± 0.34	0.19	6.67 ± 0.34	0.17
Putty-nosed monkey	<i>Cercopithecus nititans</i>	0.00	0.00	4.20 ± 0.71	0.11
Baboon	<i>Papio anubis</i>	39.14 ± 1.16	1.01	41.00 ± 0.32	1.06
Green colobus	<i>Colobus satanas</i>	0.00	0.00	20.50 ± 4.51	0.53

Table 6c showed that the Red monkeys were more in abundance in dry season having a mean of 24.50 ± 0.65 than in dry season than 17.17 ± 0.65 in rainy season while the Green monkey were in abundance in the rainy season having a mean of 16.50 ± 0.65 and 14.00 in dry season. Tantalus monkey had a value of 2.00 ± 0.25 in rainy season. There was no much variation in dry and rainy season of Tataras monkey and White throated monkey,The value of Baboons during the dry season was 39.14 ± 1.16 and increased in rainy season to 41.00 ± 0.32. Putty-nosed monkey and Green colobus were not seen at all during the rainy season but were seen only during the dry season.

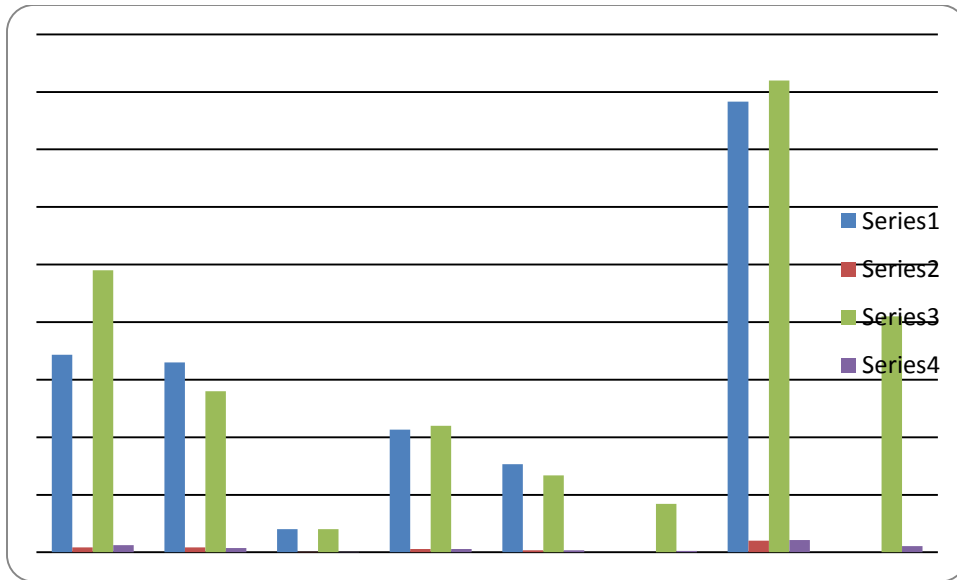


Figure 8: The distribution of primates in rainy and dry season in Old Oyo National Park

Series 1. Represent the mean in rainy season while Series 3. Represent the mean in dry season.

Series 2. And 4. Represent the sighting rate during the rainy and dry seasons respectively.

1-Red monkey; 2-Green monkey; 3-Tantalus monkey; 4-Tataras monkey; 5-White throated monkey; 6-Putty nosed monkey; 7-Baboon; 8- Green colobus.

Sex distribution of Primate species in Old Oyo National Park

Table 7: Ratio of Male to Female Primate Species in Old Oyo National Park

Common Name	Species	No. of Males	No. of Females	Male:Female ratio
Red monkey	<i>Erythrocebus patas</i>	30	120	1:4
Green monkey	<i>Chlorocebus sebaeus</i>	20	40	1:2
Tantalus monkey	<i>Tantalus sp.</i>	1	1	1:1
Tataras monkey	<i>Tataras sp.</i>	10	16	5:8
White-throated monkey	<i>Cercopithecus erythrogaster</i>	8	12	1:1.5
Putty-nosed monkey	<i>Cercopithecus nititans</i>	8	6	1:0.75
Baboon	<i>Papio Anubis</i>	40	112	5:14
Green colobus	<i>Colobus satanas</i>	10	20	1:2

Table 7 showed the Ratio of male to female Primate specie in Old Oyo National Park. *Papio anubis*, *Erythrocebus patas*, *Tataras sp.* had higher numbers of female than male. *Chlorocebus sebaeus*, *Colobus satanas*, *Tantalus sp.* and *C. erythrogaster* had almost the same proportion of male to female except for *C. nititans* that had greater number of males than females.

Adult-juvenile relationship of Primate Species in Old Oyo National Park

Table 8: Ratio of adult to juvenile species in Old Oyo National Park

Common Name	Species	No. of Adults	No. Juvenile	Ratio
Red monkey	<i>Erythrocebus patas</i>	198	3	1:0.02
Green monkey	<i>Chlorocebus sebaeus</i>	80	-	80:0
Tantalus monkey	<i>Tantalus sp.</i>	22	-	22:0
Tataras monkey	<i>Tataras sp.</i>	52	2	1:0.04
White-throated monkey	<i>Cercopithecus erythrogaster</i>	42	1	1:0.02
Putty-nosed monkey	<i>Cercopithecus nititans</i>	20	1	20:1
Baboon	<i>Papio anubis</i>	432	6	72:1
Green colobus	<i>Colobus satanas</i>	40	1	40:1
Total		886	14	1:0.016

Table 8 showed the ratio of adult to juvenile species in Old Oyo National Park and it was not a good ratio for all the primate species.

CONCLUSION

Primate abundance

Eight species of primates were eventually encountered in the park which were made up of Red monkey, Green monkey, Tantalus monkey, Tataras monkey, White-throated monkey, Putty-nosed monkey, Baboons and Green colobus. Only five of these were in abundance which were made up of Red monkey, Green monkey, Tataras monkey, Baboons and Green colobus. Others were very few and had become threatened or highly endangered within the park.

Distribution among the various transects

The reason for the uneven distribution of primates sightings were probably due to the activity of farmers and timber contractors in some part of the park, hence, very low sightings as opposed to other unopened areas of the park. Monkeys tend to stay nearer the farms where they forage for farm crops like bananas, pawpaw and vegetables used as food. The foraging takes place at the early hours of the day before the arrival of the farmers and late in the evening. Baboons feed on all kinds of fruit particularly, *Borassus aethiopum* (Plates 14 and 15).

Primates on the brink: Mankind's closest living relatives under threat around the World

Antananarivo, Madagascar (April 7, 2005) -- Mankind's closest living relatives -- the world's Apes, Monkeys, Lemurs and other Primates -- face increasing peril from humans and some could soon disappear forever, according to a report released by the Primate Specialist Group of IUCN-The World Conservation Union's Species Survival Commission (SSC) and the International Primatological Society (IPS), in collaboration with Conservation International (CI). Primates in Peril: The World's 25 most endangered Primates-2004-2006 reveals that 25 percent-or one in four-of the 625 Primate species and subspecies are at risk of extinction. The report compiled by more than 50 experts from 16 countries cites deforestation, commercial bushmeat hunting, and

the illegal animal trade as the primary threats, and warns that failure to respond will bring the first Primate extinctions in more than a century.

The golden-headed Langur of Vietnam and China's Hainan Gibbon number only in the dozens. The Horton Plains slender Loris of Sri Lanka has been sighted just four times since 1937. *Perrier's sifaka* of Madagascar and the Tana River Red colobus of Kenya are now restricted to tiny patches of tropical forest, leaving them vulnerable to rapid eradication. Hunters kill Primates for food and to sell the meat, traders capture them for live sale, and loggers, farmers, and land developers destroy their habitat. "More and more, mankind's closest living relatives are being cornered into shrinking areas of tropical forest," said CI President Russell A. Mittermeier, who also chairs the IUCN-SSC Primate Specialist Group. "This is especially true of Madagascar, one of the planet's biodiversity hotspots that has lost most of its original forest cover. More than half its Lemurs, none found anywhere else in the world, are threatened with extinction. Without immediate steps to protect these unique creatures and their habitat, we will lose more of our planet's natural heritage forever."

The World's 25 Most Endangered Primates list, compiled at the 20th Congress of the International Primatological Society in Turin, Italy, follows similar reports in 2000 and 2002. Fifteen of the primates on the new list, including the Sumatran Orangutan of Indonesia and the northern Muriqui of Brazil, are "three-time losers" for having appeared on all three lists. Seven are new additions to the 2004-2006 list, and three appeared once before. Madagascar and Vietnam each have four Primates on the new list, while Brazil and Indonesia have three, followed by Sri Lanka and Tanzania with two each, and one each from Colombia, China, Cameroon, Ivory Coast, Equatorial Guinea, Ghana, Kenya, Nigeria, Rwanda, Uganda, and Democratic Republic of Congo. Some primates on the list are found in more than one country. By region, the list includes 10 from Asia, seven from Africa, four from Madagascar, and four from South America, showing that threat to Monkeys, Lemurs, Great Apes and other Non-human primates exist wherever they live.

All 25 primates on the 2004-2006 list are found in the world's biodiversity hotspots-34 regions identified by Conservation International that cover just 2.3 percent of the Earth's land surface but harbor well over 50 percent of all terrestrial plant and animal diversity. Eight of the hotspots are considered the highest priorities for the survival of the most endangered primates: Indo-Burma, Madagascar and the Indian Ocean Islands, Sundaland, Eastern Afromontane, Coastal Forests of Eastern Africa, Guinean Forests of West Africa, the Atlantic Forest of Brazil, and Western Ghats-Sri Lanka. Habitat loss due to the clearing of tropical forests for agriculture, logging, and the collection of fuel wood continues to be the major factor in the declining number of primates, according to the report. Hunting for subsistence and commercial purposes also is a major and insidious threat, especially in Africa and Asia. Live capture for the pet trade also poses a serious threat, particularly to Asian species.

"Southeast Asia's Primates are subject to relentless poaching because of the profits to be made from the illegal trade," said Chantal Elkin, manager of the Threatened Species Program in CI's Center for Applied Biodiversity Science. "Although some of the region's threatened primates are taken as pets-notably Orangutans and Gibbons -they are most often hunted and traded for use in traditional medicines. Most of this trade appears to be international, primarily to China." As "Flagship Species" and our closest living relatives, Nonhuman primates are important to the health of their surrounding ecosystems. Through the dispersal of seeds and other interactions with their environments, Primates help support a wide range of plant and animal life that make up the Earth's forests.

The 2004-2006 list focuses on the severity of the overall threat rather than mere numbers. Some on the list, such as the Sumatran Orangutan, still number in the low thousands but are disappearing at a faster rate than other Primates. The December tsunamis that devastated coastal Sumatra have triggered a possible new threat to Orangutan habitat from resettlement of area residents. Changes to the list from 2002 reflect a desire to draw attention to other endangered Primates. For example, *Miss Waldron's red colobus*, which has gone decades without a live sighting, was replaced by the *Bioko red colobus* to show that other Colobus species also are under extremely grave threat. "All evidence tells us that the first extinctions among Africa's Primates will occur among the Red colobus," said Thomas Butynski, director of CI's Eastern Africa Biodiversity Hotspots Program. "*Miss Waldron's red colobus* in Ghana and Ivory Coast, and *Bouvier's red colobus* in the Republic of Congo may already be extinct, while the Tana River Red colobus in Kenya and *Bioko red colobum* in Equatorial Guinea could be gone within the next 20 years." (Source: Conservation International: Date: 26 April, 2005).



Plate 14: Picture of *Borassus aethiopum*



Plate 15: Fruits of *Borassus aethiopum*

To ensure that the data does not yield inaccurate densities for species that may show strong seasonality in their use of different parts of the park, the census was conducted over a period of rainy and dry seasons. Seasonally, the diurnal primate species in the park were unevenly distributed all year round from the sightings during the transect walks and also from responses to the questionnaires administered to the hunters (i.e., there was a strong seasonality in their use of the park). More primate species were sighted during the dry season which probably due to openness of the park which makes it easier to see into the park.

Among the species encountered, only the putty-nosed monkey showed a lesser number of females than males in their population. Usually, one observed a grown up adult male and few young male primates. The presence of more females in the species offers more mating partners for the males and hence, the likelihood of a rapid increase in the numbers of these species but during the period of observation, only fourteen juvenile were seen. Tantalus monkey were only two, a male and a female and always walking together, this does not spell a promising future for these primates because there will be less numbers of infants to succeed the adults when they die off should this linger.

The breakdown of the principal activities of the primates show that the Baboon and the Red monkey follow the same trend in their major activities with about 50% of their time was spent on feeding. Not many of the Tantalus monkey were encountered; it is therefore difficult to say with all certainty what their activities could portray. Generally, all possesses adaptations for climbing trees, although, Baboon are primarily terrestrial rather than arboreal (www.wikipedia.com). Locomotion techniques used include leaping from tree to tree, walking on two or four limbs, knuckle-walking and swinging between branches of trees known as branchiations. (www.wikipedia.com).

The estimated population was less than the actual primate population of primates in the park. The entire monkey encountered took to their heels as soon as they detected our presence, which is not surprising in view of the intensive hunting and other human activities observed in the park. Some species must have probably detected our presence much earlier than we could have detected theirs and fled without our knowing they were there. The white-throated monkey unlike other species tended to move quietly away when it detects danger and so is much easier for them to be under counted than others (Oates, 1985).

For a very long period in the past, the area has suffered indiscriminate and uninhibited destructive human activities including hunting. As a result, animal species have been greatly depleted and some species have either become locally extinct or rare. Fauna is relatively more abundant in the southern part of the park than other sections. The other fauna encountered in the park include Roan antelope (*Hippotragus equines*), Western Hartebeest, (*Alcelaphus buselaphus*), Kob (*Kobus kob*), Red flanked Duiker (*Cephalopus rufilatus*), Grey duiker (*Sylvicapra grimmia*), Water Buck (*Kobus defassa*), Bush Buck (*Tragelaphus Scriptus*), Oribi (*Ourebia ourebi*), Warthog (*Phacochoerus aethiopicus*).

Major anthropogenic activities around and within the park that are detrimental to the status of the park include agriculture, encroachment by settlers, unsustainable logging and plantation agriculture.

The impact of hunting for subsistence purposes in the park was without doubt, much, but the far greater menace was commercial hunting around Igbeti area which was several orders of magnitude greater. The harvest of wildlife from the park was multiplied by logging operations primarily by increasing access to previously remote areas. The new roads serve as conduits for commercially traded meat and other wildlife products according to Francis *et al.*, (2000). In

addition to the increased access by logging roads, hunting pressure in logging areas also increased because of the number of people involved in logging. Logging also provides a ready market for meat and other wildlife products. This makes local communities to shift towards commercial hunting to satisfy the demands of the loggers. Of particular concern was the tendency for hunters to target almost any species larger than 1 kg, including species that are vulnerable to extinction as reported by Bodmer et. al. (1997). One mechanism is to try to ensure that tropical log harvesting is more sustainable through logging certification. Some of the bullets and empty shells recovered from different poachers were shown in (Plate 16, 17, 18 and 19) .



Plate 16: Bullets recovered from Poacher and stored in old Oyo National Park Office



Plate 17: Traps recovered from Poachers and kept in the old Oyo National Park office



Plate 18: Loggers at work in Tede range



Plate 19: Some hunters at Ikoyi-ile range

According to the Schedule of the Amendment Order of the park right, various communities were allowed to farm within certain demarcated areas are recognized within the park. So also were the rights to reside within the park and farm within the demarcated areas (UNESCO, Man and Biosphere Reserve). Seven thousand six hundred and eighty (7,680) hectares were released for agricultural crops. But further and deeper encroachments have been made into the restricted areas over the years. It is not uncommon to see the undergrowth of large masses of land cleared to plant crops like cassava and yam. Hence, there is an ongoing destruction of the soil by this degrading agricultural practice. A biosphere reserve is an area of land or water that is protected by law in order to support the conservation of ecosystems, as well as the sustainability of mankind's impact on the environment. This means that each biosphere reserve aims to help scientists and the environmental community figure out how to protect the world's plant and animal species while dealing with a growing population and its resource needs. Biosphere reserves were created by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) under a program called Man and the Biosphere (MAB) in 1968. Since its creation,

MAB has helped dozens of countries create biosphere reserves. In order to create a reserve, a country must suggest an area of land for the MAB to approve.

There are three main parts to a biosphere reserve. The first part is called the core zone. This zone is strongly protected for the conservation of biological diversity — to make sure that different types of plants and animals are safe from human impact. The second part is called a buffer zone. These zones surround the core zones and provide a space for environmental research, recreation, and tourism. The last part is called a transition zone. A transition zone is for local communities that have a hand in managing the resources of the area through farming, fisheries, and other non-governmental activities. Ultimately, the ways that these three zones operate depend on the specific needs of the biosphere reserve they are in. Each biosphere reserve is governed by the country in which it resides. This allows each country or state to use a biosphere reserve for the region's specific needs, therefore making sure that every reserve is used wisely and for the benefit of the communities around it. Thus, each biosphere reserve has different laws and regulations about its maintenance.

There are numerous benefits to biosphere reserves. Not only can they help raise awareness of mankind's impact on the environment, but they support local communities in the maintenance of the natural environment around them. A biosphere reserve is also used for environmental recreation and education, meaning people can use the reserve to teach others about the environment, as well as use the land for nature activities, such as hiking and fishing. Biosphere reserves have also been quite helpful to scientists because the reserves create large areas of land for people to research plants, animals, and the overall conditions of the ecosystem (Source: mab@unesco.org).

Encroachment by human settlers in and around the park is also contributing to the degradation of the park as people are drawn by prospects of hunting and also of the market for meeting the needs of the people.

These plantations comprised both indigenous and exotic tree species such as Cinderella, *Tectona grandis*, Afara trees, *Gmelina arborea*. The greater majority of these plantations were of exotic trees like *Tectona grandis* and *Gmelina arborea* occurring in both mono and mixed plantations. Thus there was much destruction of natural species at the expense of the exotic ones as shown by loggers at work in Tede range of the Old Oyo National park (plate 19).

Recommendation

The future of primates in the park is not bright. According to Wilson (1989), the rate of extinction of species when their habitat is destroyed is dependent on the size of the habitat patch left undisturbed and the group of organisms concerned. Among the seven species of monkeys in the park, Tantalus and putty-nosed monkey were most likely to decline even more rapidly than others since they inhabit the very tall trees. With unregulated logging taking place, the putty-nosed monkey has a very bleak future in the park. The lower ratio of juveniles to adults does not give a promising future for the primates in the park. Further studies to determine how to reverse the process would be a valuable venture to undertake.

This census provides baseline information on the status of primate diversity and numbers within the park. This is a signal to immediately begin the conservation of the primates and other animals by Local, State and Federal government agencies. Effort should be made to conserve the putty-nosed monkey and Tantalus monkey by restricting or, at least, regulating the cutting of the very tall tree species. Also the replacement of cut-down trees through planting will help them to

regain their numbers. The section of the park where more of the monkey species were seen both in numbers and species should be protected for its primate richness.

Measures to salvage the park should commence irrespective of the extent to which the park had been disturbed. Even the natural ecosystem that had changed drastically with time at the expense of native wildlife can still be salvaged as was done in Australia by a private individual who took the initiative in 1969 to create a native fauna sanctuary. This was done by fencing off all the introduced predators from degraded farmlands and replanted them with native trees and shrubs. Some of the native animals were then re-introduced. The result was that this sanctuary, in twenty years, increased the numbers of at least rare and endangered mammals (Bolton, 1997).

There is need to reduce the impact of logging on the parks' primates by regulating logging-associated hunting. Close involvement of local communities and logging employees in proposing regulations to be adopted in the management of primates and other wildlife in the park should be encouraged. Setting up projects that would recruit, train and re-employ bush meat hunters as reserve guards, field assistants, census takers, teachers and bush meat monitors to enforce the regulations are commended. This will further enhance the sustainability of the park as enshrined in UNESCO: Man and the Biosphere Reserve, to which Nigeria is a signatory.

The need to ensure more sustainable timber harvesting through timber certification is advocated; returning back to the former method of logging by concessions and recruiting personnel to enforce this by following the loggers into the park to supervise their activities; making low-intensity selective logging a component of the conservation plan for primates, since it is more compatible with primate conservation according to Chapman et al. (2000) instead of the high intensity logging which is detrimental to primates.

The intensity of hunting in the park particularly in Ikoyi-Ile and Igbeti area is unsustainable. Regulations should be put in place to limit the hunting to a sustainable level through the Forestry Department and village heads in and around the park; establishing extension programmes to provide locally-appropriate production of alternative source of protein and cash will reduce the hunting pressure on the primates and other wildlife. These programmes will use community-based techniques to educate reserve communities about the ecological and health risks as well as the need to conserve both faunal and floral life of the reserve.

Protection of key areas for primates within the park leaving them as primary section will create a system of unlogged blocks within the logging concessions which may serve as a refuge for the primates, and from which they can re-colonise logged areas. It is suggested that, at least, 20 percent of the total area of the logging concessions be based on prior field surveys. This will also serve to protect other wildlife.

The need to endow and institutionalize primate (or even wildlife as a whole) protection teams to enforce wildlife laws through interdiction and prosecution is advocated. Feasibility of reintroducing Chimpanzees and Gorillas into the park should be considered. If the prospects of reintroducing them are good.

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APPENDIX I

TRANSECT DATA COLLECTION SHEET

1. Date _____ 2. Time _____
3. Species sighted _____
4. Initial cue to detection _____
5. Sighting distance _____
6. Total number _____ 7. Group spread _____
8. Number of females _____ 9. Number of males _____
10. Number of adults _____ 11. Number of juveniles _____
12. Activities engaged in _____
13. Where sighted (on tree (high/low) or on ground) _____
14. Vegetation type of place sighted in _____

APPENDIX II

QUESTIONNAIRE DATA FORM

PRIMATE PRESENCE IN OLD OYO NATIONAL PARK AND FACTORS AFFECTING THEIR NUMBERS AND DISTRIBUTION

1. Data _____ 2. Occupation _____
3. How long have you been hunting/patrolling in the reserve? _____
4. How often do you hunt/patrol in the reserve? _____ Almost every day _____ Once per week _____ Once in two weeks _____ One per month _____ Less than once per month.

A. PRIMATE PRESENCE

5. Have you been seeing primates in the reserve? ____ Yes ____ No
6. If "Yes" how often do you see them in the reserve
 ____ Always ____ Occasionally ____ Rarely
7. Which kinds of primates have you been seeing?
 ____ Gorillas ____ Chimpanzees ____ Monkeys ____ Prosimias
 ____ Others
8. Do any of the primate migrate? If so, which?
 Migrating primates Times they have To where Times they return
 _____ _____ _____ _____
 _____ _____ _____ _____
9. Which primates are diurnal and which are nocturnal?
 Nocturnals _____
 Diurnals _____
10. Are there any extinct primates species in the reserve?
 Names When last seen
 _____ _____
 _____ _____


B. PRIMATE DISTRIBUTION

11. Are the primates evenly distributed in the reserve? ____ Yes ____ No
12. If no, which locations are they concentrated more in _____
13. What factors influence their distribution in this way _____
14. Which primate species have you been seeing and in what locations did you see them?
 Species Locations seen
 _____ _____
 _____ _____
15. Which species is more abundant in the reserve and why? _____
16. Which species is least abundant and why? _____
17. Are species no longer common?
 Names Why so? When last reported seen where last seen
 _____ _____ _____ _____
 _____ _____ _____ _____

C. PRIMATE EXPLOITATION

19. How often do you kill/trap primates?
 ____ Once/weekly ____ Once/bi-weekly ____ Once/monthly ____ Once/yearly
20. For what purposes do you kill/trap primates?
 ____ Food ____ Pests ____ Pet ____ Life sale ____ Others (specify)
21. What number of each species do you kill/trap per year and what purposes?
 Species Number Purposes
 _____ _____ _____
 _____ _____ _____
 _____ _____ _____
22. What factors contributed to your killing/trapping the most and the least?
 (a) The most _____

- (b) The least _____
23. How much of a pest are primates seen to be?
 _____None _____Little much _____Very much
24. How do people respond to them in view of this? _____
25. Are primates seen to be of any usefulness? If so, which _____
26. Are there any laws regulating hunting in the reserve (government or community)? If so, which? _____

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