UNIVERSITY OF AGRICULTURE
ABEOKUTA, NIGERIA

HOME .ON TlfE RANGE: CRISES, CONSE.QUENCES AND CONSOLATIONS

g'~

PROFESSOR (REV.) SAMUEL AKINYELE ONADEKO
Professor of Wildlife Management
Department of Forestry and Wildlife Management
College of Environmental Resources Management
(COLERM)




UNAABINAUGURALLECTURE
Series no. 17

UNAAB
INAUGURAL LECTURE SERIES

HOME ON THE RANGE: CRISES, CONSEQUENCES AND CONSOLATIONS

BY

SAMUEL AKINYELE ONADEKO
B.Se (Ibadan), M. Se (Texas, A & M), PhD (Ibadan)
Professor of Wildlife Management,
University of Agriculture, Abeokuta, Nigeria

An Inaugural Lecture Delivered at the
University of Agriculture, Abeokuta, Nigeria.

August 25, 2004

UNAAB
INAUGURAL LECTURE SERIES

SAMUEL AKINYELE ONADEKO

A Publication of the University of Agriculture
Abeokuta, Nigeria

Published August, 2004

ISBN:978-37053-0-X

University of Agriculture, Abeokuta

Printed by Intec Printers Limited, Ibadan

The Vice-Chancellor of the University of Agriculture
Deputy Vice-Chancellor
Other Principal Officers of the University,
My Dean, College of Environmental Resources Management
Other Deans and Directors,
My Head of Department
Other Heads of Departments
Eminent Invited Guests
Highly Esteemed Colleagues
Great Unaabites
Ladies and Gentlemen

It is with much thanks to the sovereign and all-powerful God and with joy unspeakable, humility and elation that I stand before you all, to present my inaugural lecture titled *"Home on the Range: Crises, Consequences and Consolations';* the 11th in the series of inaugural lectures in this giant among Nigerian Universities.

This is the first inaugural lecture in 2004. It is the first inaugural lecture in the subject area of Wildlife Management in the Department of Forestry and Wildlife Management. I give all the Glory to God because, like most inaugural lecturers, it is the first inaugural lecture to be delivered from my family.

The race is neither for the swift nor the battle for the strong but good time and good chance happen to them all. Some few months ago, while attending the grand finale Sunday service of the 48th National Convention of my church, the man of God encouraged all and sundry to pray to be the next on the line for good things. On reaching the office the following day (Monday), my Dean came to my office, opened the door gently and said "you are next on the line for Inaugural Lecture".

Integrity requires that what is true must be faced. I have learnt that what I can do on time and what I ought to do by the grace of God, I will do. I have come to face inaugural lecture at this time as a matter of integrity. On the inaugural calendar, the lot has fallen on my college: The College of Environmental Resources Management. At the College level the index stopped at the Department of Forestry and Wildlife Management. Lo and behold, the only professor next on the line.

I am also reliably told that in its original setting and history, the opportunity for inaugural lecture should come at the early stage of ascendancy to the exalted position of a professor even though for some this opportunity comes much later. While the opportunity presents itself, some for personal reasons, could decide they need more time. But indeed this is an unforgettable occasion and a milestone in my career as an academic.

WHAT 'S UP THE PROFESSOR

My stewardship in the few years of my pilgrimage has been based on the burden for Wildlife Conservation and Management, thus forming the bed rock of my inaugural lecture. By research and professional practice during the few years (1976 to date) in Wildlife Resources Conservation and Management, I have sharply focused on three major aspects:

(i) Human dimension elements of Wildlife Management and Conservation
(ii) Key habitat issues of wildlife species- an important aspect because wildlife management in the final analysis is habitat management and
(Hi) \ Wildlife production

Mr. Vice- Chancellor Sir, permit me to note that there are precisely six (6) professors in the field of Wildlife Management and Conservation nationwide, and I happened to the sixth professor

but the third to present inaugural lecture. The earlier inaugural lecturers in the field are Professor 5.5. Ajayi (Inaugul"~1lecture was delivered on the 27th February, 1986 and titled "Wildlife in crisis: Conservation antidote") and Professor T.A Afolaye.n; my first degree project supervisor (Inaugural lecture delivered on the 27th January, 1987 and titled "Man's Inhumanity to Nature: The over exploitation of wildlife resources"). Incidentally, I did not lay my hand on their inaugural topics until my topic had been approved by the University. I was certainly divinely led, and I join them even now in asserting the serious crisis and precarious situation of the Nigerian Wildlife as well as global wildlife and biodiversity. Humankind has come to be seen as the destroyer of the variety and variability among wild living organisms and the ecological complexes of which these organisms are constituent parts. The unabated and indiscriminate persecution and perturbation of wildlife resources and habitats remain the major concern fqr well-meaning and environmentally minded persons world over.

The Open Range

Mr. Vice-Chancellor Sir, for now, the only place that is known to support human life is the earth. Yet several activities credited to man such as deforestatiqn, desertification, atmospheric pollution, indiscriminate consumptive utilization and other uses are progressively making the planet less fit to live on (Allen, 1980). The ecnth has not only been a home for humans (yellow, red, black and white) but also for other forms of life.

In the pre-civilization era, man once lived in the open range under tree canopies and crevices of the rock. Today, the story is different. Human habitations now bear the full mark of the 21st Century modernization, civilization and development. As the most advanced of all living creatures, man now makes his home with solid concrete walls and pillars, covered with corrugated iron

sheets, aluminum or slates; and windows with louvers and other exotic panes - translucent, tinted or stained panes, shielded from cold and hot winds, rains and storms. Under his technically domesticated settings man is privileged to live a highly enriched, organized and controlled life. Within the same plains of the biosphere, however, is the "Home on the range" where the antelopes, the elephants, the giraffe, the lions, the reptiles, the amphibians and the avians defenselessly play. They make their living amidst the trees, shrubs, wild flowers, and other herbs. Under this open range with the heavens above, sometimes bright or silvery, sometimes blue and sometimes with thiCkly dark clouds are these non-human creatures destined to range.

Upon these hosts of the home on the open natural range- Mr. Vice-Chancellor Sir, from the smallest ants to the largest terrestrial mammal, the elephants, I have set my inaugural lecture. What is their plight? What is their present status? And what does the future hold for them. The totality of man's natural environment is greatly modified by his activity (past and present). What can be termed a truly pristine environment or wilderness is hard to come by. Phrasal notes like "in those days" or "we used to have" or "there once existed in large population" are not uncommon in respect of wild animals and plant species that are no more existing in their former range of nativity. For example, "Agufon" is the Yoruba name for Giraffe *(Giraffa came/oparda/is).* The fact that the Yorubas have a name for the animal probably suggests that their natural home range areas extended as far as the southern coastal reaches. But today Giraffe is no more in the Nigerian fields. Presently they are only sighted in the Cameroon fringes. Alheritiere (1979) quoted Plato of many centuries ago mournfully reminiscing over the great loss of a mountain vegetation thus.

> "There are mountains in Attica that can not keep nothing but bees, but that were clothed not so long ago with fine trees, producing timber suitable for roofing the largest buildings. The roofs hewn from this timber can still be seen. There are also many lofty trees cultivated, and the country produced bountiful pastures and ranges for animals. In those days, the annual supply of rainfall was not lost, as it is now, through being allowed to flow over a treeless and denuded surface to the sea."

In the genesis of life from the Holy Bible (Genesis 1:27) man was made a superior being over all others of God's creation and was mandated to be fruitful, to multiply, to replenish the earth and to subdue it and to have authority and dominion over all other creatures - the fish of the sea, fowls of the air, and over every terrestrial creature of God. In His investiture, God further said, "Behold I have given you every herb bearing seed, which is upon the face of the earth and every tree in which is the fruit of a tree yielding seed; to you shall be for meat (Gen. 1:29).

Mr. Vice-Chancellor Sir, in this divine mandate, as an environmentalist and wildlife manager, I see three things in the heart of God (i) Conservation, (H) Sustainability and (Hi) Development. It is clear from the Holy Bible that God as the creator of all things and Himself being the first and foremost environmentalist and ecologist would neither subscribe to over-population nor would He approve extirpation of biodiversity (Deut.7:22; Gen. 6: 17-20). It is however sad to note that the man and the society of today are ever than before more concerned with what to consume than to conserve. Yet where there is no conservation, there can be no sustainability and the absence of sustainability of resources rules out an enduring development.

Definitions with Relevant Annotations

Wildlife Management as an aspect of natural science is replete with terr::s and terminologies. At this point of my lecture, it will be gainful and most rewarding to define certain terms before further exegesis.

- Wildlife or wild animal species refers to all living things, plants, invertebrates and vertebrates outside the direct control of man (that is, all non-cultivated plants and non-domesticated animals). It embraces all animals in their natural habitats. They are undomesticated anima' lswhich may be small organisms only visible to humans if seen through a microscope or as big as the elephant or whale. Wild life includes but it is not limited to insects, spiders and birds, reptiles, fish, amphibians, and mammals if not domesticated (NeF, 1994).

- Biodiversity or biological diversity refers to the total variability of living organisms on the planet (UNEP, 1995). It is defined in terms of genes, species, and ecosystem which are the outcome of over 3,000 million years of evolution. As a biological concept, biodiversity is an essential or a necessarytool for human survival.

- Wildlife management has been defined as the combination and application of business methods and ecological knowledge to manipulate undomesticated fauna and flora (wild animal and plant) resources in a way that ensures their products and services will be sustained. The application of ecological principles and knowledge to the management of wildlife entails certain basic approaches viz:

- Preservation of wild species and allowing nature to follow a balance, devoid of any human intervention

- Direct or indirect manipulations of wild fauna population such as through cropping, culling, habitat alteration and other habitat management tool so as not to exceed carrying capacity.
- Maintenance of useful and desirable species.
- Sustained-yield management through limiting consumptive utilization to annual production capacity (Eltrimgham, 1984; Afolayan, 1987; Ayodele *et al., 1999).*

- Conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs and aspiration of future generations. Conservation as rendered involves preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment.

- Consumptive utilization is the extraction of resources for the production of consumer goods and services. Apart from proviG:~g food other types of consumptive uses of wildlife include products such as skins and hides, materials for and crafts, or ceremonial uses, oils and medicines, live animal trades, sport ,hunting, stock resources for domestication or improvement of domesticated breeds, farming activities and mineral resources exploitation. All activities directed towards production of goods and services which often lead to the degradation of the environment.

- Non-consumptive utilization is defined as the provision of natural amenities and services for recreational use such as game viewing, nature trail, swimming, boating and other water related recreational activities in lake, and waterfall. It includes spiritual and religious values, values due to the

willingness of local and international user-public (tourists) to pay to see living and non-living resources in the natural setting

- Sustainable use is the rate of harvest within the capacity of species and their habitats to maintain themselves. Sustainable use can be non-consumptive or consumptive in nature.

- Commercial use is defined as the management of native wildlife for profit. The terms utilization and commercial use are interchangeable.

- Extinct –Species is no longer existing or living.

- Ecological extinction is defined as the reduction of a species to such low abundance that though it is still present in the community, it no longer interacts significantly with other species.

- Extirpation - Speciesis not extinct, but no longer occurring in a wild state or no longer exhibiting patterns of use.

- Endangered - Any native species in immense danger of extirpation or extinction.

- Threatened - Any native species likely to become an endangered species within the foreseeable future.

- Special Concern - Any native species for which welfare concern or risk of endangerment has been documented.

- Biosphere - that is the thin layer of the earth surface and atmosphere inhabited by living organisms.

Biogeographical Coverage

The planet earth is the home of a great diversity of natural ecosystems inhabited by different faunal and floral species variable in size, richness and diversity as well as in degree of isolation from other similar habitats (Mackinnon *et a/.*/ 1986). The representative coverage of the earth's wild species and ecosystems showed different places with different local species richness, uniqueness and endemism. The typical wild faunal resources available to a given locality are referred to as source faunas. Wildlife and biodiversity have evolved for millions of years over the biosphere, to occupy various ecological niches and have provided for the needs of every component of the food chains and webs. (Wilcox, 1984; Mackinnon *et a/.*/ *1986).*

Through biogeographic classifications, the geographic ranges of all living things are revealed. The flora and fauna of anyone region or zone exhibit uniformities that set it off from other regions; that is, key habitat units are marked more by the differences between them than by the resemblance within them. It is by their boundaries that they are best defined. These boundaries could be more precisely described as transition zones. Some are narrow, others are Wide, and some are clear and definite (Pielou, 1979).

The Pangaea and the non-human crises

The earth surface has experienced restlessness for quite a long time. Explosive geologic forces and processes and other non-human forces; gradual as well as catastrophic events such as earth quakes and volcanic eruptions have caused the earth blocks to shake Violently. One of the changes in biogeographical patterns is the one caused by earth plate movement and they are of course long-term changes. The configuration of the earth land mass has

varied through geographic time, particularly during the last 230 million years (Pielou, 1919).

Mr. Vice-ChancellQrSir, I believe that it will stimulate the interest of a vast majority pf us to learn that up till the end of the Permain period which is the last period of the Paleozoic era (230 million years ago) the earth's land surface was believed to be "Pangaea"- all the continents were joined to form one single super continent surrounded by a single universal ocean "Panthalassa" (Fig.1). About 200 million years ago- at the beginning of the Mesozoic era, Pangaea began to split into fragments. The belief that continents, have not always been fixed in their present position was suggested as early as 1596. It was not until 1912 when Alfred Lothar Wegener, a German meteorologist came up with the scientific theory of continental drift that the issue of Pangaea became clearer. Wegener posited that Pangaea began to split apart around 200 million years ago. Pangaea first broke into two land masses, Laurasia in the northern hemisphere and Gondwanaland in the southern hemisphere and then the two land masses (Laurasia and Gondwanaland) continued to break apart into the various smaller continents that exist today.

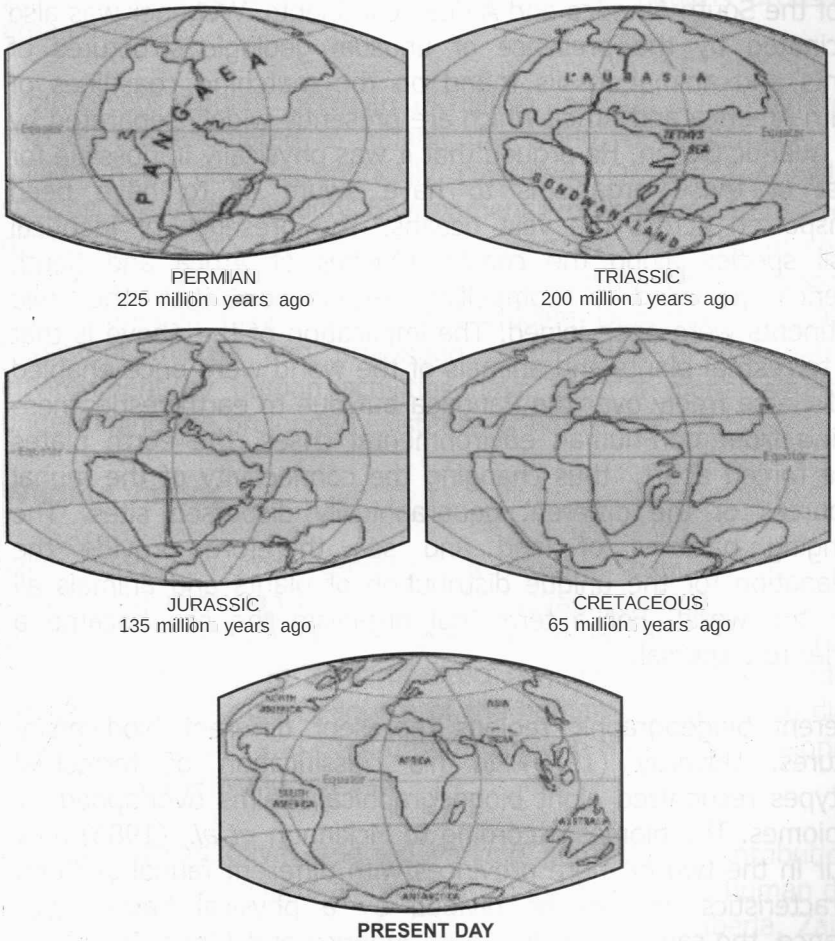

Fig.I. The super-continent Pangaea breaking up about 225-200 million years ago, eventually fragmenting into the present day continents

Wegener based his theory on what appeared to be a remarkable fit of the South America and African continents. Wegener was also fascinated by the presence of unusual geologic structures of plants and animal fossils found on the matching coastlines of South America and Africa which are presently widely separated by the Atlantic Ocean. He argued that it was physically impossible for most of these organisms to have swum or to have been transported across the vast oceans. The presence of identical fossil species along the coastal reaches of Africa and South America provided a compelling explanation that the two continents were once joined. The implication of the above is that the terrestrial plants and animals of the world were once enabled to disperse freely over the Pangaea but due to earth restlessness arising from non-human environmental crises, the earth plates were forced apart, .thus changing the connectivity of the faunal resources of the different geographically dispersed sites. The changing patterns of land and sea therefore provide the explanation for the unique distribution of plants and animals all over the world. For a terrestrial organism the sea became a barrier to dispersal.

Different biogeographic regions represent different biodiversity features. Udvardy (1975) in his classification of terrestrial ecotypes recognized eight biogoegraphical realms overlapped by 14 biomes. The biomes according to Mckinnon *et a/./* (1986) may occur in the two or more provinces with different faunal or floral characteristics or may be divided by a physical barrier. For instance, the savanna of the South America and Africa, India and Australia reflect similar climatic conditions but different animals and plants association and provinces of the same biome separated by ocean. The implication is that every nation and continent must learn to view its renewable natural resources in a global perspe~tive and realize its international and global responsibility to protect samples of a given biogeographical province and the corridor along which the responsibility is shared. This is

particularly important when we consider the nations protected area coverage.

From recent studies, between 14 million and 100 million different species are estimated to inhabit the world, of which only 1.7 million have been scientifically classified. Of the 1.7 million species, the United Nations Environment Programme's Assessment of the Biodiversity reported that between 5% and 20% of some groups of animals and plants species respectively are threatened with extinction (Texas Parks and Wildlife Department, 2002.). Persistent misuse and prolonged perturbation of the natural environment by human activities have been a global situation undermining the prolonged existence of native species.

Wildlife Values

Wild living resources represent a natural resource of great significance for most forest and savannah-dwelling human communities as well as for those living in many other rural contexts (Table 1). In terms of direct benefits to humans, wildlife. animals provide a major source of the human protein in the diets of rural, sub-urban and even urban people in the many developing countries of the world.

Several authors have reported varying percentage contributions (20 - 90%) of wildlife to animal protein in the average human diet in Benin Republic, Cameroon, Ghana, Ivory Coast, Liberia, Zaire, Nigeria, Sub - Saharan Africa and Latin America (Ajayi 1971, 1974; Asibey, 1974; Devos,1977; Von Richter, 1979; Sale, 1981; Prescott - Allen and Prescott - Allen,1982) . Irrespective of the percentage contribution, it is certain that there is a short fall in the per caput protein contribution in many countries ameliorated by wildlife sources. The wild species being used include insects, caterpillars, maggots, snails, rodents, monitor lizarp, birds and

pes and primates (Defoliart, 1989; Redford *et al.*,

are also valued for products that are needful for uch as clothing, tools, medicine, materials for j art. Many other animal products (such as elephant lusk from musk deer, rhino horn, tiger body parts, pelts, etc.) have attracted significant commercial l, national and international markets (Redford *et al.*, am, 1984; Asibey, 1974; Afolayan 1987; Onadeko

:l species throughout history have been valued in >ms, mythology and folklores and in almost all f the world, their central roles still remain. Of much us is the African tortoise of the Yoruba homestead :icular beloved *Yonibo* will always be rememb ered of the old school days.

ecies have a number of advantages over and above nals such as high consumer preference, \ high dressed carcass weig ht, and richness in protein and nts, (Tables 2 and 3) and adaptation to local :limate anc Vdiseases and ability to efficiently utilize :>ecies of plants that constitute their food.

Table 1. a

DIRECT CONTRIL
Food frol
Bushmeat
Eggs
Insects:
Adults; larvae
Honey
Flavouring

various antelopes and primates (Defoliart, 1989; Redford *et al.,* 1995).

Wild animals are also valued for products that are needful for subsistence such as clothing, tools, medicine, materials for handcrafts and art. Many other animal products (such as elephant tusk,(ivory), musk from musk deer, rhino horn, tiger body parts, skins and fur, pelts, etc.) have attracted significant commercial values in local, national and international markets (Redford *et al.,* 1995; Eltringham, 1984; Asibey, 1974; Afolayan 1987; Onadeko *et al.,* 1989).

Several wildlife species throughout history have been valued in religious customs, mythology and folklores and in almost all communities of the world, their central roles still remain. Of much application to us is the African tortoise of the Yoruba homestead fables. In particular beloved *Yonibo* will always be remembered with nostalgia of the old school days.

Wild animal species have a number of advantages over and above dom~stic animals such as high consumer preference, \high percentage of dressed carcass weight, and richness in protein and mineral contents, (Tables 2 and 3) and adaptation to local conditions of climate anc\Vdiseases and ability to efficiently utilize available key species of plants that constitute their food.

Table i. The roles of wildlife in food security in Africa and other values

DIRECT CONTRIBUTION		**INDIRECT CONTRIBUTION**	
Food from wild animals		**Household income**	
Bushmeat	Smoked Fresh Salted biltong	Employment	Hunters Traders; Helpers Shop bar workers Services linked to the tourist industry Craft workers Wildlife officers
Eggs	Birds, turtles	**Macro-economy**	
			Tourist Industry Sport hunting, game viewing Local(hunting permits/ taxes) Export trade(live animals) Export trade(skins, hides, trophy
Insects:			
Adults; larvae			
	Roasted Dried boiled		
Honey		**Influence on Health**	
Flavouring			Wild animals parts/ products- medicines Use of wild animals in drug development Spiritual& mental health

Table 1 contd.

			Cultural & religious values
		Influence of Agricultural systems	
			Seed dispersal, pollination, manure Pests, As pests - Massive defoliators - Devastation of farm crops (destructive raids) - Marauding and rogue species. pathogen reservoirs
Other Values of Wildlife			
Socio - cultural Values		Religions, customs, mythology and folklores	
Socio - economic values		Products for subsistence; clothing, tools, medicine, Materials for handcrafts, trade, income and foreign exchange.	
Ecological values		Pollination, seed dispersal, decomposition, herbiVOry, predation, habitat structure.	
Educational values		Tourism and recreation: science club, field laboratory,	
Research and scientific values		Natural History Ecology. Immunological specimens.	
Gene Bank		For improvement and diversity, of resources.	

Sources: Onadeko, 1996 and Ntiamoa – Baidu, 1997

Table 2. Proximate composition (g/100g) of meat of some wild animal species compared with selected domestic animals.

Species	Common name	Moisture	Protein	Fat	Ash
Rodentia					
Paraxerus cepapi		74.3	21.0	3.2	1.5
Aethomys kaiseri		73.1	19.1	3.0	2.0
Cricetomys gambianus	African giant rat	49.1	42.6	4.7	2.6
Dasysmys sp.		71.7	21.0	4.0	2.0
Lophuromys flavopunctatus		66.7	27.5	2.9	2.6
Praomv.sp.		70.0	19.8	7.0	2.0
Saccostomus campestris		68.4	19.0	10.2	2.0
Thamnomv.sp.		70.7	16.3	3.4	2.0
Pelomys fal/ax		75.1	19.9	2.8	1.8
Hystrix africae-australis		48.0	45.8	41	1.7
Thryonomys swinderianus	Grasscutter	52.0	28.0	16.8	2.9
Cryptomys hottentotus		69.2	16.6	9.9	1.8
Carnivora					
Herpestes naso	Long-snouted mongoose	72.7	18.8	1.9	3.3
Genetta pardina	Forest Genet	31.8	55.4	9.3	6.0
Artiodactyla					
potamocheerus aethiopicus	Red river hog	70.1	23.8	1.6	1.1
Neotragus pygmaeus	Royal antelope	74.5	23.4	0.9	1.2
Cephalophus sp	Crown duiker	74.6	20.8	3.4	1.2
Sylvicapra Grimmia	Grey duiker	59.5	33.4	2.0	4.0
Tragelaphus	Bushbuck	47.6	50.9	12.2	3.7

Table 2... contd.

scriptus					
Hyracoidea					
Dendrohyrax arborea	Tree hyrax	78.7	16.1	2.9	1,9
Primata					
Ceroopithecus aethiops	Green monkey	80.3	17.6	1.3	1,1
Proboscidea					
(skin) *Loxodonta africana cylotis*	Elephant				
Mollusca					
Achachatina marginata	African giant snail	73.8 1	18.28	1.32	1.57
Domestic animals					
Ox(beef)		73.8	19.6	12.0	1,0
Sheep(mutton)		78.5	17.2	-2.9	1,0
Pig(pork)		64.8	19.4	13,4	0.8

(Sources: Ajayi & Tewe, 1979; Malaisse & Parent, 1982)

Table 3. Energy and mineral content of some Rodents used as food resource

Species	Energy		Ca	P	Fe
	kJ	Cals	mg	Mg	Mg
Paraxerus cepapi	497	119	230	250	5
Aethomys kaiseri	455	109	400	270	15
Cricetomys Gambianus	936	224	400	360	10
Dasysmys sp.	526	126	280	225	10
Lophuromys flavopunctatus	601	144	300	170	7
Praomv.sp.	618	148	270	300	10
Saccostomus campestris	723	173	550	350	15
Thamnomv.5O.	418	100	280	225	10
Pelomys tal/ax	459	110	210	270	8
Hystrix atricae-australis	973	233	150	310	5
Thryonomys swinderianus	1132	271	320	380	20
Cryptomys hottentotus	668	160	150	220	15

Source: Malaisse and Parent, 1982

Wild animal species are also intimately associated with definite ecological niches (creating and maintaining the forest and savannah environment, pollination (birds, bats, bees, and insects), decomposition (Vultures, dung beetles, other insects and earthworm), seed dispersal (birds, monkeys, rodents, fish, ants, etc, seed predation(rodents, birds, beetles), herb ivory or plant-eating(insects, mammals) and predation or hunting of other animals(insects, mammals, reptiles, birds). According to Hill (1997) elephants playa key role in forest ecosystems. They are important agents of seed dispersal. The seeds of *Ba/inites wi/soniana* have coevolved to the extent that their chances of germination are largely dependent on reaction with enzymes in gut of the elephant. The activity of elephants contributes to the complexity of the forest by maintaining open areas. Damages caused by elephants contribute to the retarded regeneration of large gaps and prevents the communities of such areas reaching their climax state, thus creating a mosaic of habitats that

enhances the biodiversity of the forest. The characteristics of the great diversity of the natural world ecosystems such as composition and structure of vegetation are influenced by the ecological roles of the animals. Also they influence the reproductive processes of plants, contribute to soil fertility, and serve as regulators of pest population. In areas where elephants were removed, the bush land dominates, soil fertility is reduced and a great number of micro ecosystems which are reliant upon the elephant deteriorate (Janzen and Martins, 1982; Redford *et al.,* 1998; Hill, 1997).

Mr. Vice-Chancellor Sir, it is also pertinent to put on record that wildlife values are not all positive. Some negative socio-ecological values of wildlife species include the locust swarm of Africa and Asia, as well as pests capable of massively defoliating and devastating grains on hectarage of farm lands (e.g. the Senegal parrots; the Quela birds etc. Elephants even though highly valued for the ivory constitutes a nuisance and dangerous threat when marauding in farm crops and villages. So also is hyena *(Crocuta crocuta)* as rogue animals against domestic stocks. Chimpanzees and other primates are also culprits for their destructive raid on farm crops around some forest resources (Ogunjemite, 1998; Agbelusi *et al., 2000).*

Critical global wildlife situation

At local and international levels, several fora on the environment have shown concern on the critical state of the environment and the need to conserve the environment for sustainable economic development aimed at the survival of mankind in the biosphere (Boaten, 1998).

The problems confronting the natural environment, in particular the wild living resources are multi- factorial and quite ramifying. Predominant factors include:

- Population growth, technology and development
- Bushmeat trade
- Habitat degradation
- Violation of traditional conservation methods
- Political instability
- Ecological health hazards
- Managerially inappropriate strategies.

Source of the predominant features of the crises are discussed to present a clear picture of the situation.

Population growth, technology and developments

Human growth, in the last century has brought about great changes in the ways people use wildlife resources. Increased human numbers has increased the need to employ more resources for feeding, clothing and to provide infrastructures such as human settlements, roads, opening virgin lands for agriculture, industries and factories.

Recent technologies have dramatically changed traditional practices. Means of hunting, capture and killing of wildlife have become sophisticated. Fire - arms and appliances are the most readily available example of such changes. More powerful flashlight and headlamps have mitigated spatial and temporal constraints, allowing exploitation of nocturnal al'Jimals that previously were rarely harvested.

Unsustainable consumptive utilization and bush meat trade

Of all the consumptive uses of wildlife, commercial bushmeat trade is a major and singular conservation crisis confronting the sustainability of almost all species of wildlife. Any meat from wild

animals is called bushmeat "Eran Igbe" and it could be consumed fresh, smoked, salted, or sun-dried. Smoked bushmeat, however, is the final product most widespread and readily available in the rural, sub-urban and urban markets in most African settings (Ntiamoa- Baidu, 1997).

Almost all species of wildlife are acceptable as a food resource in Africa. While some species may be unacceptable or tabooed by some clans or tribes, the same species may be delicacies to another clan or tribe in another location. Hundred of species belonging to 236 genera were reported as food resources that are eaten in Africa.

Commercial bushmeat trade, according to the Jane Goodall Institutes (JGI) report (1999) is the most significant and immediate threat to the future of wildlife populations in Africa today and could lead to the loss of several species in 15 years time, including Chimpanzees. In West Africa and the Central African sub- regions, a vast majority of communities are involved in hunting. Approximately 50% of households earned their income from bush-meat sales in the Congo's forested area. In Cameroon, 95% of people in the villages adjacent to the Dja Reserve and 50% in nearest towns are bush-meat hunters. For Ghana, between 70 and 80%, Botswana is between 40 and 60% and in Zimbabwe, at least 60% (Muchaal and Ngandjul, 1995; Ntiamoa - Baidu, 1997).

The contribution of wildlife to rural livelihood remains greatly undervalued. Bushmeat trade is generally informal and usually fostered through poaching (illegal hunting). As a result of the informal and usually illegal nature of bush-meat trades, the accurate estimates of its contribution to rural economies is difficult to accomplish. Afolayan (1987) reported N30 million per annum for the 'estimate of bushmeat consumed in Nigeria. Survey of some forest resources and bushmeat markets revealed that

annual off- take of wildlife for bushmeat would exceed 79,899 tons per year (Amubode and Agossa 1985). Anstey (1991) however, reported that the trade is worth more than timber trade. In Nigeria, the off take of wildlife from forests and savannah to supply bush-meat appears enormous when one travels from one section of the country to t.he other (Onadeko, 2000).Common species of wildlife enumerated in bushmeat processing centers (Asejire; Idi-Ayunre and Kila) between 1991 and 1992 are shown in Table 4. Grasscutter *(Thryonomys swinderianus),* Grimm's duiker *(Sylvicapra grimmia)* hare *(Lepus crawshayl)* and tree hyax *(Dendrohyax arboreus)* were most abundant and common in all the study centers. Trends in the mean number of grasscutters returned by hunters are shown in Fig. 2. Most of the grasscutters were killed by hunters during the months of Decemper and January (Dry season) (Onadeko, 1996).

Four main stakeholders play immense role in this trade. They are hunters, (comprised of local opportunists, specialist guilds, migrant commercial hunters and local professionals), loggers, traders/ vendors and eventually consumers. By implication or application, almost everyone can be classified as a poacher- either by connivance or actual practice. The demand for bushmeat by all at food restaurants goes a long way to foster the illegal bushmeat trade (Onadeko and Meduna, 1984; Onadeko *et al., 1989).*

annual off- take of wildlife for bushmeat would exceed 79,899 tons per year (Amubode and Agossa 1985). Anstey (1991)' however, reported that the trade is worth more than timber trade. In Nigeria, the off take of wildlife from forests and savannah to supply bush-meat appears enormous when one travels from one section of .the country to the other (Onadeko, 2000).Common species of wildlife enumerated in bushmeat processing centers (Asejire; Idi-Ayunre and Kila) between 1991 and 1992 are shown in Table 4. Grasscutter *(Thryonomys swinderianus),* Grimm's duiker *(Sylvicapra grimmia)* hare *(Lepus crawshayl)* and tree hyax *(Dendrohyax arboreus)* were most abundant and common in all the study centers. Trends in the mean number of grasscutters returned by hunters are shown in Fig. 2. Most of the grasscutters were killed by hunters during the months of December and January (Dry season) (Onadeko, 1996).

Four main stakeholders play immense role in this trade. They are hunters, (comprised of local opportunists, specialist guilds, migrant commercial hunters and local professionals), loggers, traders/ vendors and eventually consumers. By implication or application, almost everyone can be classified as a poacher- either by connivance or actual practice. The demand for bushmeat by all at food restaurants goes a long way to foster the illegal bushmeat trade (Onadeko and Meduna, 1984; Onadeko *et al., 1989).*

Table 4. Wildlife species in the bush-meat collection centres (1991-1992)

Order jWildlife species	Common names	Bushmeat collection centres			
		Asejire	Idi-Ayunre	Kila	Total
RODENTIA					
Thryonomys swinderianus	Grasscutter	559	361	456	1,376
Cricetomys gambianus	Giant rat	39	26	14	79
Protoxerus stangeri	Forest Squirrel	77	16	9	102
Xerus erythropus	Ground squirrel	47	9	29	85
Atherurus africanus	Bush-tailed porcupine	-	9	6	15
LAGOMORPHA					
Lepus crawshavi	Hare	23	56	112	191
INSECTIVORA					
Potamogale velox	Otter shrew	3	-	1	4
PHOUDOTA					
Manis gigantean	Giant pangolin	24	11	7	42
HYRACOIDEA					
Dendrohyrax arboreus	Tree hyrax	68	94	165	327
CARNIVORA					
Nadinia binotata	Tree or palm civet	10	1	17	28
PRIMATE					
cercopithecus aethiopicus	Green monkey	-	-	26	26

Table 4..... contd

ARTIODACTYLA					
Sylvicapra grimmia	Grimm's duiker	213	179	32 1	713
Tragelaphus spekei	Sitatunga	-	-	1	1
Tragelaphus scriptus	Bush buck	10	4	8	22
Cephalophus rafilatus	Red-flanked duiker	16	8	11	34
Cephalophus niger	Black duiker	21	6	10	37
Potamochoeru 5 porcus	Red river hog	18	-	-	18
AVES(Phasianidae)					
Numida melgaagris	Guinea fowl	-	-	6	6
Francolinus bica/caratus	Francolins	-	32	2	39
REPTILES					
Varanus niloticus	Monitor lizard	17	12	16	45
Maja melenoleuca	Black cobra	-	4	2	6
Python sebae	Royal python	2	4	3	9
Bitis gaboonica	Gabon viper	1	-	-	1
Total					**3,134**

Source: Onadeko, 1996

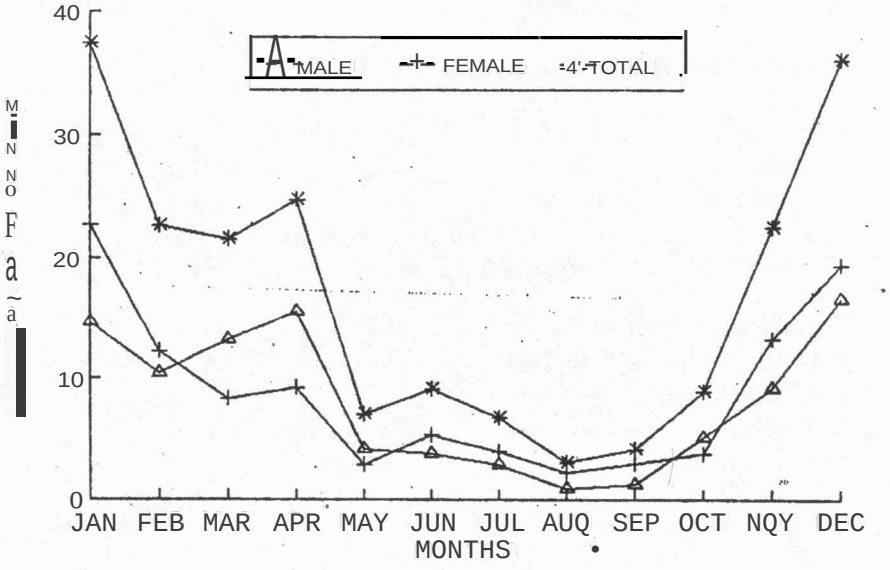

Fig.2. Trends in the mean number of grasscutters returned by the hunters (No/day) between 1991 and 1992

Salient bushmeat facts presented by the reports of JGI (1999) concerning unsustainable use of wildlife animal species as bushmeat in some parts of Africa are as follows:

- More than one million metric tones of bush-meat are taken from the Congo Basin forests each Vear.
- In Brazzaville (Republic of Congo), approximately 15,000 carcasses passed through the markets in 12 months. Of these 293 were chimpanzees.
- The total value of the bush-meat trade has been estimated at 50 million US dollars annually.

- Chimpanzees meat brings 20-25 US dollars per piece (prices vary regionally).
- In South west Cameroon, hunting is estimated to contribute to a third of all household income.
- It has been estimated that 1200 logging company employees consumed up to 80 tons of bush-meat in one year.
- Bushmeat trade could eliminate all viable populations of Africa apes within the next 5-15 years.
- More humans are born each day (approximately 350,000) than the total number of great apes alive on the planet.

Other consumptive uses of wildlife include but are not restricted to the following: products such as skins and hides, handcrafts, oils, medicinal ingredients, live-animal trade, sport hunting for games, and stock sources for domestication or improvement of domestic breeds.

Habitat degradation and loss

Opening up of forest and savannah frontiers has reduced the areas suitable for myriads of wildlife and biodiversity. Habitat destruction or alterations due to annual indiscriminate burning, logging, mining, clearing for agriculture and pasture development, cattle grazing, lopping of browse plants, building of dams, and high ways and urbanization are considered to be the leading cause of the alarming rate at which wild living species are vanishing. Current records show that human activities have altered over one-third of the earth's surface and thereby threatened the existence of many plants and animal species (JGI, 1991; Onadeko, 1985).

The alarming decrease in Nigerian forest estate and the rapid changes taking place in the forest ecosystem as in many parts of the world has been an issue of deep concern (Allen, 1980; Isichei,

1995; Ola-adams, 1999). The trend is clearly exemplified by the comparison of the report of the assessment of the land use of vegetation (LUV) through out the whole federation of Nigeria for the period 1976/78 and 1993/95. Prominent changes are summarized in Tables 5 and 6. This rate of deforestation is quite frightening and more devastating data might be awaiting future assessment. Ola Adams (1999); Papka (2000) showed the major changes as follows:

(i) Massive degradation all over the country.
(ii) Desertification has shifted southwards from $12°30^1$ to $10°30^1$.
(iii) Land use brought under agricultural production expanded from 503,000km^2 to 585,000km^2(an increase of 82,040km^2 i.e. 4560km^2 per annum.
(iv) Siltation of rivers and lakes.
(v) Attendant effects are showing on the recession of Lake Chad beyond the International boundary of the country.
(Vi) Huge salt deposits threatening the major rivers of Benue and Niger with accompanying effects on the Niger-Delta outfit while other perennial rivers are becoming annual.

Table 5. Broad land use classification changes

Land Use	1976/1978 (km^2)	1993/1995 (km^2)	Change (km^2)
Agriculture	502,935	585,000	+ 8,2000
Natural Forest	234,300	151,000	- 83,000
Shrub/ Grassland	134,000	117,000	- 16,000
Degraded Access	2845	26310	+ 23,000
Built up area	2,080	5,440	+ 3,3000
Water bodies	29,700	20,900	- 8,000

Source:, FORMECU LUV Study report (1996).

Table 6. Vegetation and land use classes for 1976/1978 and 1993/1995, Nigeria

Land Use Category	1976/1978		1993/1995		Change (km^2)
	Area (km^2)	o/o of country	Area (km^2)	o/o of country	
Intensive (Crop) Agriculture	322794	35.5	365491	40.2	42697
Extensive (grazing) Agriculture	166326	18.3	187236	20.6	20910
Dominantly Shrubs/Grasses	113880	12.5	81694	9.0	- 32186
Dominantly Trees/ Woodlands/ Shrubs	151293	16.6	81386	9.0	- 69907
Floodplain Agriculture	9451	1.0	20918	2.3	11467
Disturbed Forest	14573	1.6	18990	2.1	4417
Gullies	122	<0.1	18517	2.0	18395
Forested Freshwater Swamp	18316	2.0	16499	1.8	- 1817
Undisturbed Forest	25951	2.9	12114	1.3	- 13837
Dominantly Grasses	12549	1.4	11983	1.3	- 566
Discontinuous Grassland	6137	0.7	11248	1.2	5111
Mangrove Forest	9994	1.1	9977	1.1	- 17
Shrub/ Graminoid Fresh	16899	1.9	9248	1.0	- 7651
Water Marsh/ Swamp					
Extensive	3518	0.4	9206	1.0	5688

Table 6……contd.

Agriculture with Denuded Area					
Grassland	1034	0.1	7989	0.9	6955
Natural Water bodies	6591	0.7	7851	0.9	1260
Montane Forest	6792	0.7	6759	0.7	- 3
Urban (major + minor)	2083	0.2	5444	0.6	3361
Riparian Forest	7402	0.8	5254	0.6	- 2148
Sand Dune	812	0.1	4829	0.5	4017
Montane Grassland	1739	0.2	3112	0.3	1373
Reservoir	1327	0.2	2888	0.3	1561
Rock Outcrop	1424	0.2	2632	0.3	1208
Agricultural tree Crop Plantation	830	0.1	1641	0.2	811
Forest Plantation	997	0.1	1573	0.2	576
Teak/Gmelina Plantation	628	0.1	1156	0.1	528
Irrigation Project	147	0.1	988	0.1	841
Graminoid/Segde Freshwater Marsh	4882	0.5	871	0.1	- 4011
Saltmarsh/ Tidal Flat	4	< 0.1	545	0.1	541
Rainfed Arable Crops	16	< 0.1	485	0.1	469
Alluvia	487	0.1	269	< 0.1	- 218
Livestock Project	52	< 0.1	139	< 0.1	87
Mining Areas	0	0.0	62	< 0.1	62
Canal	2	< 0.1	29	< 0.1	27

Source: FORMECU LUV Study Report (1996).

In 1976/1978 gully erosion increased from 122 km to 18,400 km and Sand dunes from 820 km to 4,830 km respectively.

Areola (1987) also reported the decline in total area of undisturbed forest within the high forest zone of Nigeria as follows: Freshwater forests (1.6%= - 13,837 km^2); swamp forest 0.2% (-1817 km^2) and Riparian forest 0.2% (-2148 km). Similar alarming decline was also reported in areas of some State forest resources: 3-5% per year in Kano; 8-14% in Kaduna, 11-15% in Bauchi and 16-21% in Sokoto. In the last three decades or more, the treFld has been to de -reserve reserved areas for other uses. A total of about 6938 hectares of forest was dereserved for rubber and oil palm plantations in Edo, Delta, Ondo, and Oyo States (Omiyale, 1993).

Violation of traditional conservation method

In African setting, every locality or community has sets of traditional conservation laws and regulations commonly known as taboos. Table. 7 compares the floristic richness of a sacred grove at Ikere- lie (Nigeria) with farmlands (arable and tree crops) to demonstrate the influence of traditional conservation methods aimed at alloWing the earth to continually replenish itself. For example in some areas, forest groves were set aside by various communities for religious and other traditional rites. Many activities such as hunting, fishing, fuel wood gathering, etc were forbidden in such groves. Hagan (1997) listed seven traditional laws for the sustainable use of bio-systems as follows:

- Laws of exclusion prohibited entry in (orests, lakes or rivers except at period of severe scarcity and critical needs.

- Laws of selective extraction protected certain species or prohibited the destruction and use of immature animals;

pregnant animals were generally not killed for consumption.

- Laws for diversification of use are found in clan or community dietary taboos, so that whole communities might not over-exploit one or two crops or animals.

Table7. Floral characteristics of arable crop farmland, tree crop farmland and sacred grove at Ikere-Ile Nigeria

	Arable crop farmland	Tree crop farmland	sacred grove
1) No. of families	34	46	67
2) No. of species	58	72	155
3) Trees	14	30	54
(a) Mean dbh (em)	24.31	29.64	23.91
(b) Mean Tree height (em)	8.19	9,44	11,95
(c) Mean Grown depth (em)	4.92	5.99	7.62
(d) Mean Grown width(cm)	3.85	5.6	6.86
(e) Mean Tree spacing	7.07	3.54	3.23
4) Shrubs	14	13	31
5) Herbs	27	21	59
6) Climbers	3	8	12
7) Rainkieer's Life-Forms (No. of species)			
(a) Megaphanerophytes	3	8	20
(b) Mesophanerophytes	11	22	34
(c) Microphanerophytes	14	13	30
(d) Nanophanerophytes	16	12	43
(e) Chamaephytes	4	1	11
(f) Hemicryptophtes	7	8	5
8) Complexity, Index	1,70	48.95	230.57

Source: Alabi, 1992.

- Laws regulating exploitation, enforced by rites for closing and opening rivers, lakes and forest under constant use, enabled species varieties, ecosystems to regenerate and reproduce.
- Laws communizing "firing of land" in preparation for farming ensured that possible fire hazards can be contained.
- Laws protecting special species of plants and animals from misuse (certain trees could not be cut for fire wood) ensure high stock levels.
- Laws enforcing rites for felling of big trees and animals ensured the protection of big trees and animals and made the ecosystems around them safe; for several kinds of plants and animals that lived close to or around them to survive and thrive.

Many of these measures have, however, now broken down.
Under the impact of modern civilization and technological breakthrough, the strong bonds and linkages that exist between human life and the other liVing creatures are breaking apart. The cultural bonds and linkages are demystified and demythologized. The direct bond between the societies and the sacred forests and groves are broken because the cultural forest and groves are no longer seen as necessary for survival. The sacred groves and mystical authorities of the traditional enforcement agents are treated with contempt (Hagan, 1997).

Ecological health

Another critical issue relating to the home on the range is the increased risk of human exposure to new animal borne diseases or to existing diseases transmitted in new ways. Considerable negative health implications are already bein~ connected with tbe processing and consumption of wildlife. Hunting, collecting,

dressing and eating bushmeat according to BCTF (2003) places people at increased risk of contacting animal borne diseases.

The disease which has made the greatest and loudest global impact in recent times is the Acquired Immune Deficiency Syndrome (AIDS). In Cameroon, serological analysis of some 800 monkeys sampled from hunters' returns for sale in markets showed that 17% of the monkeys were infected by one of the Simian Immune Deficiency Viruses (SIV) as well as 13 monkey species out of 16. The diversity and distribution of the virus also made it possible to isolate five new strains and to highlight the risks for 30 monkey species. The survey indicated the likelihood of the appearance of a new HIV 3 of AIDS. It is clear, that both the hunting and eating of certain bush-meat species represent a high risk of exposure of human to lethal zoonotic viruses from SIV through chimpanzee for HIV1 and Mangabe for HIV2.

Also several species of rodents make up a sizeable proportion of the bush-meat trade in Africa as most of the larger animals have been hunted to low numbers. Rodents such as giant rats, grasscutters, multi-mammate rat, porcupine, squirrels are regularly consumed. Rodent consumption as food have been associated with health risks in recent times. The multi-mammate rats of the genus Mastomys is generally known as the reservoir of the Lassa virus. Lassa virus fever, an acute virus illness has been a serious problem in the last few years in tropical Africa.

According to NEST (1991) one of the invisible but ubiqUitous and particularly insidious and infamous environmental pollutants in Nigeria is a group of biocides known as chlorinated hydrocarbon pesticides. The residues of these pesticiJesremain in the soil after use and these are transported to the plants, animals and man at the tbp of the food chain (Osibanjo, 1990). Osibanjo observed that wildlife species face high risk from exposure to untreated industrial and domestic waste. The adverse effects in the soil

dressing and eating bushmeat according to SCTF (2003) places people at increased risk of contacting animal borne diseases.

The disease which has made the greatest and loudest global impact in recent times is the Acquired Immune Deficiency Syndrome (AIDS). In Cameroon, serological analysis of some 800 monkeys sampled from hunters' returns for sale in markets showed that 17% of the monkeys were infected by one of the Simian Immune Deficiency Viruses (SIV) as well as 13 monkey species out of 16. The diversity and distribution of the virus also made it possible to isolate five new strains and to highlight the risks for 30 monkey species. The survey indicated the likelihood of the appearance of a new HIV 3 of AIDS. It is clear, that both the hunting and eating of certain bush-meat species represent a high risk of exposure of human to lethal zoonotic viruses from SIV through chimpanzee for HIV1 and Mangabe for HIV2.

Also several species of rodents make up a sizeable proportion of the bush-meat trade in Africa as most of the larger animals have been hunted to low numbers. Rodents such as giant rats, grasscutters, multi-mammate rat, porcupine, squirrels are regularly consumed. Rodent consumption as food have been associated with health risks in recent times. The multi-mammate rats of the genus Mastomys is generally known as the reservoir of the Lassa virus. Lassa virus fever, an acute virus illness has been a serious problem in the last few years in tropical Africa.

According to NEST (1991) one of the invisible but ubiquitous and particularly insidious and infamous environmental pollutants in Nigeria is a group of biocides known as chlorinated hydrocarbon pesticides. The residues of these pesticides remain in the soil after use and these are transported to the plants, animals and man at the top of the food chain (Osibanjo, 1990). Osibanjo observed that wildlife species face high risk from exposure to untreated industrial and domestic waste. The adverse effects in the soil

include phytotoxicity, mortality of beneficial insects and wUdlife, loss of reproductive efficiency in some species, loss in soil fertility and environmental contaminations. Ecotoxicological and environmental pollution disaster problems worldwide is exemplified in Table 8 (Osibanjo, 1990).

Effects of unsustainable utilization

Much of the original forest cover has been removed. Extensive forest areas have given way to secondary and degraded forests, then to savannas and finally to sahelian conditions (Boaten, 1998). At least one-third of the earth's surface has been altered and the existence of many plant and animal life has become threatened. JGI (1999) reported that the entire species of plants and animals being lost every 20 minutes sum up to 27000 species every year. Over the past half century, the population numbers of our four closest relatives- the chimpanzees *(Pan troglodytes),* gorillas *(Gorilla gorilla),* orangutan and bonobos (Pan *paniscus)* have declined by at least 50%. Recent figures (Table 9) indicate that fewer than 150,000 chimpanzees remain in the wild in Africa where about two million chimpanzees roamed their natural range in the 1900 (JGI, 1999).

Table 8. Examples of humal1 and ecological disasters associated with pesticides usage worldwide

Country and Year	Nature of Disasters
Minamata, Japan 1957-1960	Methy-mecury poisoning of people eating fish polluted by mercury. 120 dead.
Vietnam 1960	High birth defect rates recorded in areas where United States Armed Forces applied 2, 4, 5-T herbicide for forest defoliation during the Vietnam war.
Turkey 1962	3,000 people poisoned 330 deaths after ingesting seed grains treated with hexachlorobenzene.
Tijuana,Mexico 1968	Severe poisoning and deaths recorded for people after meal of bakery products contaminated with parathion.
Alamegrordo, Mexico 1971	Organomecurial fungicide. Farmers were poisoned by eating contaminated pork.
Pakistan 1976	Melathion poisoning of 7,500 public health field workers. 5 deaths recorded.
Seveso, Italy July 10, 1976	Accidental release of poisonous dioxin due to an explosion at the Hoffman. La Roche Plant. Surrounding areas declared high health risk. 1000 residents were resettled. Children developed Chloracne.
Dove Canal, Niagara falls. U.S.A 1977	Human poisoning, high birth defect rate from pesticides and industrial chemicals buried underground 25 years earlier.
Ondo State, Nigeria 1982	20 public, health field workers poisoned by malathron in Ondo State.
Bhopal, India De(.4, 1984	2,500 people were killed in the industrial city of Bhopal due to accidental release of poisonous methyl isocyanate gas from union carbide's pestic:ideplant.
Basel. Switzerland November 1,1986	30 tons of pesticides mixture discharge into the Rhine. Tons of dead fish. Incident claimed no human lives and area declared National disaster.

Source: Osibanjo(1990)

Table 9. Estimated population of the remaining Chimpanzees and Gorillas in Africa

Chimpanzee overall 180,000	**(2500 in captivity)**	**Endangered**
Western Chimpanzee (P.t. verus)	12,000 – 20,000	
Nigerian Chimpanzee (P.t. troglodytes)	5,000	
Central Chimpanzee (P.t. schweinfurthii)	96,000	
Bonobo (Pan paniscus)	10 - 25,000	
In the Congo Basin Region	80,000	
Gorilla overall	**130000**	**Endangered**
Western Lowland Gorilla (G.g. gorilla)	50,000 - 90,000	
Cross River Gorilla (G.g. diehli)	200	
Eastern Gorilla (Gorilla beringei)	17,000	
Mountain Gorilla (G.b. beringei)	300	
Grauer's Gorilla (G.b. graueri)	17,000	
Bwindi Gorilla (G.b. subspecies unknown)	300	
In The Congo Basin Region	100,000	

Source: JGI, 1999

The remaining substantial amount of forest in some areas are "empty forests" because the major wildlife in them has been mostly killed off (Datarri, 2002). Many unique and endemic species have been subjected to excessive perturbation and are at risk due to the alteration of landscape and their native habitats. For example, Australia is the home to more than one million species, many of which are not found any where else in the world. About 85% of the flowering plants, 84% of mammals, more than 45% of the birds and 89% of in-shore temperate zone fish are endemic. That is they are restricted to Australia and are not found in any other place in the world. Today, many of the plants and animals have become extinct. Because of the dramatic declines in their prey resources, Africa predator populations are significantly threatened (Eves and Stein, 2002).

Substantial evidences indicate that the present consumptive utilization of wild living resources is unsustainable and that more local and global extinction are imminent. Table 10 shows the life span, gestation length and the litter size of some African mammals. The information on litter size and gestation period reveals how fast the off take from the population of the various species can be replenished. Approximately 67% of the species listed have a litter size of one young and gestation period of at least 150 days, and up to 660 days (African elephant). This among other things explains why the population numbers of various species are declining due to increasing poaching pressure.

Petrides (1965) listed eleven larger mammals in Nigeria that were threatened with extinction as follows: Gorilla *(Gorilla gorilla),* Cheetah *(Acynomyx jubatus),* Ostrich *(Structhio camelus),* Chimpanzee *(Pan troglodytes),* Hippotamus *(Hippotamus amphibious),* Lion *(Panthera leo),* Giraffe *(Giraffa carmelopardalis),* Leopard *(Panthera pardus),* Klipspringer *(Oreotragus oreotragus),* Hunting dog *(Lycaon pictus)* and Manatee *(Trichelus senegalensis).* Holsworth (1969) listed the

Table 10. Life span, gestation length and litter size in some African mammals

Species	Common name	Life span (Years)	Gestation Period(Days)	Litter Size
Loxodonta aficana	African elephant	50	660	1
Diceros bicornis	Rhinoceros	50	510-540	1
Potamochoerus porcus	Bush pig	12-15	150	2-8
Phacocherus aethiopicus	Warthog	15	171-195	2-4
Hylochoerus meinertzbageni	Forest hog	15	120	2-6
Hippopotamus amphibious	Hippopotamus	40-50	227-240	1
Hyemoshus aquaticus	Water Chevrotians	-	120	1
Giraffa camelopardis	Giraffe	15-20	402-450	1
Tragelaphus scriptus	Bush buck	15	220	1
Alcelaphus buselaphus	Western Harebeest	15	214-242	1
Hippotragus equunus	Roan antelope	10-15	275	1
Kubus defassa	Water buck	15	225	1
Kobus kob	Kob	15	210-240	1
Reduna redunca	Red buck	10	232	1
Oreotragus oreotragus	Klipspringer	10-12	210	1
Ourebia Ourebi	Oribi	10-12	210	1
Cephalophus rufilatus	Red flanked duiker	10	120	1
Cephalophus maxwelli	Maxwell duiker	9	120	1
Sylvicapra grimmia	Grey duiker	9	120	1
Syncerus caffer	African buffalo	20	330-345	1

Table 10... ....contd.

(jazelli dama	Red-fronted gazelle	10-12	150	1
Lycaon pidus	Hunting dog	15	60	12
Cilnis adustus	Side-Striped jackal	10-15	60	3-7
Viverra civetta	Africa n Civet	15	60	2-4
Mellivora capensis	Honey Badger	20	150-180	2
C(ocuta crocuta	Spotted Hyena	25	110	1-2
Atinonyx jubatus	Cheetah		84-94	2-4
Panthera pardus	Leopard	15	90	2-3
Panthera leo	Lion	30	105	2-6
Felis serval	Serval cat	10-15	60-90	2-4
Papio anubis	Anubis Baboon	20	200	1-2
Cercopithecus aethiops	Creen monkey	16-24	200	1-2
Erythrocoebus patas	Patas monkey	15-25	150-180	1-2
Pan troglodytes	Chimpanzee	40	216	1
Gorilla gorilla	Gorilla	33	251	1

Source: Petrides(1965), Walker(1978)

rhinoceros *(Diceros bicornis)* among the extinct animals in the Nigerian fields. Nine other wildlife species with more restricted habitat preferences were also reported as no more in Nigeria are Dama gazelle *(Gazella dama),* Dorcas gazelle (Gazelle dorcas), White Oryx *(Oryx algaie!),* Giant eland (*Taurotragus derbianus),*Greater Kudu *(Strepsiceros strepsiceros)* Bongo *(Boecarcus eurycerus).*

Happold (1987) stated succinctly that rhinoceroses, giraffes and cheetahs are already extinct in Nigeria. Available evidence according to Happlod showed that these animals lived in recent times in Nigeria. Table 11 shows the global rec;ord of the number of endangered and extinct animal species coinpile d from the IUeN'S Red list, 1996.

Rodents also make a sizeable proportion of the total bushmeat trade in West Africa as most of the larger mammals have been hunted to low numbers. Of the 349 African rodents species that appear with regularity in commercial bushmeat trade, commonly hunted species include the grasscutter *(Thryonomys swinderianus),* giant rats *(Cricetomys gambianus),* squirrels *(Proxerus stangeri* and *Xerus erythropus)* and porcupines *(Atherurus africanus)* (Happold, 1987; Onadeko, 1996). The range of rodent species directly affected by bushmeat trade is not great but the number of animals consumed can be considerable. In some places such as the Eastern Democratic Republic of Congo (ORe) where human population is dense and land fully cultivated and other wildlife species over hunted, certain species e.g. the giant rat have become locally exterminated. Also some populations of grasscutters are well below carrying capacity, or have become extinct due to local over-exploitation (Stein *et al., 2002).*

Table 11. Number of endangered and extinct animal species compiled from the IUCN's red list, 1996

Class	critically	endangered	endangered	vulnerable	total	extinct
Mammals	169	315	612	1096	89	
Birds	168	235	704	1107	108	
Amphibians	18	31	75	124	5	
Reptiles	41	59	153	253	21	
Insects	44	116	377	537	73	
Other animals	471	423	1194	2088	343	

Source: IUCN, 1996

In many tropical habitats, wildlife populations are abysmally depressed because they have been hunted down to levels below which their populations can be viable. Some of the animal species may not be completely extirpated but are reduced to such level that they no longer perform their ecological functions. In such cases, for all practical purposes the animals involved can be described as ecologically extinct.

The Hope

The global situation of wildlife species already presented is gloomy and the consequent doom is frightening, yet the half has not yet been told. The basic principles of the Earth Charter affirms that humanity is endowed with the knowledge and technology to reduce the impacts on the environment

The "earth charter" or declaration of basic principles to ensure the future Viability and integrity of the earth as a hospitable home for human and other forms of life, resulting from the Rio de Janeiro conference in 1992 has given the world some hope and consolations for the future. Efforts at conserving biological diversity have to be offered greater attention (Wangari, 1998).

Hopes and consolations are borne out of scenarios such as the ones below:
In 1930, according to a wildlife census report, only about 20-30 tigers survived the deliberate attempt to exterminate the tiger in Russia arising from political and economic conflicts. In 1952 with few tiger left, Russia became the first country to ban the hunting of this animal. With legal protection, the population of tiger grew to about 400. Another example is the Arabian Oryx which went extinct in the wild in the 1970s. It was reintroduced early in 1990 with the release of a herd of captive bred animals into Mahazat Assaid Reserve, a part of their natural home range. Today there is a viable population of 91 animals. A herd of Gheem gazelles - a

species which was greatly diminished in many of its former strong holds has also been reintroduced in this reserve while a herd of Idmi gazelles was successfully reintroduced into the Wubian ibex Reserve of Hawat Bani Tamin. All the ani mal species reintroduced were bred at the Wildlife research centres of the National Commission for Wildlife Conservation and Development in Saudi Arabia. Several avifauna species have also been successfully bred in captivity while field studies have yielded much-needed information on the ecology and movements of some elusive birds like bustard (IUCN 1993). The point is clear that all wild living species as renewable natural resources can be restored back to sustainable level if agents of perturbations (humanity, in particular) are brought under control..

The conservation and management of wildlife resources have been approached from various angles in the last decades. Innovative developments in natural resources management are now pursued in several places. In South Africa for example, emphasis had been on sustained utilization of wildlife through grassroot ownership/ participation programmes of ADMADE (Administrative Management Design) and LIRDP (Luangwa Integrated Resource Development Project) in Zambia as well as CAMPFIRE (Communal Area Management Programme for Indigenous Resources) in Zimbabwe. While the CAMPFIRE programme is based on the philosophy that natural resources, particularly wildlife, can only be conserved by communities which live with them, ADMADE does not emphasize conservation per se, since conservation among rural Africa often connote restrictive regulations and law enforcement.. However ADMADE proVides an uncomplicated design to administer wildlife management through local participation and leadership, with guarantees that agreed revenues accrued from the resource return to local villages in the form of employment and community, development..

In West Africa, particularly Nigeria, the concept of sustained utilization of wildlife resources informed the development of support zone activities among communities resident in enclaves and adjacent villages to conservation areas. This programme has been successfully implemented in the Okomu wildlife sanctuary and Cross River National Park where s~all scale businesses are set up for the rural communities to divert them from resource exploitation.

Holistic approach to ecosystem conservation is now advocated across the globe. This is an approach to wildlife conservation that include component in the interest of the local communities. In the past, attempts to solve the problems of conservation have focused on symptoms (such as poaching) rather than the cause (poverty, .. lack of knowledge, frustration etc). Any attempt to resolve the unsustainable use of wildlife must be judged against its ability to satisfy the livelihood of the rural communities particularly the poor (Asibey and Child, 1990~ Robson and Redford, 1991; Brown-Jones *et al.,* 2002; Brown and Williams, 2003).

In recent times, chapters are now b"eing included in anthropologies that focus on the human factors which influence the conservation of wildlife, indigenous people and wilderness. Rose *et aI.,* (2004) argued that we must change people in order to save animals and that the job of saving wildlife has more to do with clothed; people than hairy animals.

In places where conservation efforts are packaged as sources of long term development rather than problem to local communities, they have been greeted with successes because the local communities now joined in the conservation struggle and made conscious efforts to conserve the resource of their development. It is now clear that wildlife policies that prevent local communities from utilizing the natural resources must provide viable alternatives of survival to the commonities.

As part of the viable solutions, alternative options being offered in many places to dissuade and reduce frequency, intensity and reliance of people on bush-meat hunting for their livelihood include:

(i) Domestic and captive rearing of some wild species as a substitute to hunting e.g. Grasscutter(*Thryonomys swinderianus)* and DUiker(*Cepha/ophus spp)* in Africa, the Agouti *(Agaoti pac a)* in South America.
(ii) The development of alternati\"e income-earning opportunities - for example, craft production for the tourist market.
(iii) Employment of poachers from the community as wildlife protection staff.

Ever than before, individual and corporate concerns (local and international) are beginning to speak out through mass media, and other communication links for the living species that cannot speak for themselves. More governments and authorities are beginning to realize that other species apart from humans have right to exist as part of natural creation and part of a divine design. More people now share the view that the global economy and ecology will degenerate to pandemonium if the rich web of life that support all life on the planet earth is allowed to be irretrievably destroyed.

The volume of materials presently circulating through internet and other electronic media on the issue of the environment opens the world to one and only option and that is to conserve as much of the world as possible. Numerous scientists and research work all over the world are presently dedicated to bringing together the body of knowledge (biological, ecological, anthropological, economic, social, traditional etc) that can contribute to environmental conservation, sustainable development as well as

demonstrate the way for man to live harmoniously in the biosphere.

At present, awareness of environmental and subsequent implication has resulted in planning strategies which do not only seek to concentrate attention on the socio-economic benefits of projects but also seriously consider the effects; such projects may have on the environment. Most governments and agencies now insist on impact assessment report before project are approved for execution.

The World Conservation Strategy (WCS) prepared by four of the world's leading conservation agencies- the International Union for Conservation of Nature and Natural Resources (IUCN), World Wildlife Fund (WWF), Food and Agricultural Organization of United Nations (FAO) and the United Nations Environmental Programme (UNEP) - launched in 1981 demonstrates how the conservation of liVing resources is essential for sustaining development. Local and international agencies and concerned groups (NGO's) are making considerable impacts and successesin their conservation activities allover the world. Some of the Non-Governmental Organizations (NGO's) actively working to protect wildlife and preserve a healthy habitat before they are totally destroyed are listed in Table 12.

IUCN and WWF have worked assiduously to save the Tiger in the Indian subcontinent, Indochina and Indonesia. Since 1992 the Philadelphia Zoo has promoted conservation actions in Liberia (West Africa). Endowed with vital rainforest and unique wildlife, Liberia is the home of species such as Chimpanzees, forest Elephant, Dianna monkey and giant Pangolin. As a result of its top position in plant and wildlife richness and diversity, Liberia is a conservation priority. The goal of Philadelphia Zoo is to find practical solutions to both wildlife and human crises created by unsustainable bush-meat trade and utilization in Liberia.

Table 12. Some supportive agencies and strategies for wildlife and biodiversity conservation

AWF	African Wildlife Foundation
CAW	College of African Wildlife
CCA	Caribbean Conservation Association
CIEI	Center for International Environment Information
CITES	Conservation for the International Trade in Endangered Species of Fauna and Flora
CSG	Cat Specialist group
ECWP	Exxon Corporation Wildlife Partnership
EEC	European Economic Community,
EWS	East African Wildlife Society
FAO	Food and Agricultural Organization
FFPS	Fauna and Flora Preservation Society
FTF	Friends of the Earth
FZS	Frankfurt Zoological Society
GASP	Global Animal Survival Plan
GTF	Global Tiger Forum
ICBP	International Council for Bird Preservation
ICCE	International Centre for Conservation Education
IUCN	International Union for the Conservation of Nature and Natural Reserves
NAS	National Audubon Society
NCF	Nigerian Conservation Foundation
NFWF	National Fish and Wildlife Foundation
NWF	National Wildlife Federation
OP	Operation Tiger
PTES	Peoples Trust for Endangered Species
SECM	School of Environmental Conservation Management
SFWS	School for the Formation of Wildlife Specialist
STF	Safe the Tiger Fund
TIC	Tiger Information Center
TNCIP	The Nature Conservancy International Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WCS	Wildlife Conservation Society
WCS's	Wildlife Conservation Society
WCU	World Conservation Union
WES	Wildlife Conservation Strategy
WWF	World Wildlife Fund

Contribution To Wildlife Education, Training And Research

Technical Education And Training

Relevant knowledge is essential to ensure effective and efficient management of wildHfe resources. I have been involved in the training of personnels for wildlife service since 1977. I started my work career with Forestry Research Institute of Nigeria, Jericho, Ibadan and was deployed to School of Forestry, Jos. Until 1978, there was no technical curriculum for wildlife education in Nigeria to cater for the much-needed middle-level man-power. Up to this time, training efforts were at the game protection level i.e. for Game Guards. This was a vocational training package administered as part of the general forest guards' training programme at the school of forestry. A single subject course in wildlife management was offered as part of the technical foresters training at the schools in Jos and Ibadan.

The Federal Government's approval for the establishment of the Federal School of Wildlife Management was contained in the 1975-80 National Development Plan. It was an FAO/UNDP - assisted project from the outset. The Food and Agriculture Organization (FAO) of the United Nations provided fellowship for overseas training of Nigerian staff to specialize in the various aspects of Wildlife Management and Conservation. Some staff were trained in East Africa but my fellowship training award took me to Texas A&M University, College Station, Texas, United States of America where I specialized in Wildlife Management and Park Interpretation.

Since the Wildlife School project was FAO assisted, an FAO Project Manager and Nigerian Co-Project manager/Principal were put in place. At a time, I had the priviledge of occupying the position of Co-Project manager and the Principal of the Wildlife School.

Teaching at the School began with the training of wildlife protection staff (Wildlife/Game Guards), followed almost at once by Ordinary National Diploma programme and later the Higher National Diploma programme was added. Several other courses have now been added.

Wildlife Management Education In UNAAB

In 1989, I transferred my service to the University of Agriculture as the pioneer lecturer in Wildlife Management and related subjects. The Department of Forestry, Fisheries and Wildlife Management was one of the earliest Departments created when the University of Agriculture, Abeokuta came into being in January 1988 in accordance with National University Commission (NUC) guidelines. Fisheries was excised with effect from October 1, 1994 to become the Department of Fisheries and Aquaculture leaving the Department of Forestry and Wildlife Management.

Wildlife programme of the Department of Forestry and Wildlife Management both by curricula and practice, is geared towards self-employment. As an in-house field laboratory, our wildlife domestication and multiplication building was initially put in place at the mini-campus (Isale-Igbein) and no ~ooner than we moved to the permanent site of the University of Agriculture, the animal house was erected with concrete blocks contiguously joined to the snail rearing unit. The wildlife domestication and multiplication house (grasscutter and snailry) provide ample on-site practical exposure for our students, apart from field practical experiences and opportunities in the natural range areas of the wild living resources. Apart from grasscutter, species of edible land snails being raised are *Archachatina marginata* (Yoruba-Agenu), *Archachatina achatina* (Yoruba-Aginisho), *Achartina fulica* (a variant of marginata endemic to riverine areas)

One of the wild living creatures that nobody ever loves which also is lesser known are the animals generally grouped as herpeto - faunas (the reptiles and amphibians). No student passes through wildlife programme of the department without handling and collecting snakes of various species. By now we have close to 200 snakes of various species in our collection largely from road kills. The Department is equipped with sound academic curricula and programmes. As Head of Department of Forestry and Wildlife Management for four years (1997 - 2001), academic staff strength of 8 grew to seventeen seasoned, professionally trained, competent and dedicated scientists of international repute including the immediate past Vice Chancellor of this great University, "Forester" Professor Julius .A. Okojie.

Research

The problem of wildlife management and conservation are both social and ecological (Ayeni *et al.*, 1982). In my contribution to knowledge through problem-solving research studies, I have focused on three major aspects of wildlife management viz:

(i) Human dimension elements.
(ii) Key habitat issues.
(iii) Wildlife production (reproductive ecology of Grasscutter/ domestication and multiplication).

Human Dimension Factors of Wildlife Management

Studies conducted on human-related problems of wildlife include emergent conflicts between Fulani graziers and wildlife resource protection in Kainji Lake Basin (Onadeko *et al.,1994),* public knowledge and attitudes towards wildlife (Onadeko and Meduna,1984), status of the American alligator (Alligator mississipiensis) in relation to planning and developing facilities and 'services for visitors use at Brazos Bend State, USA (Onadeko,1992), human persecution of wildlife outside

conservation area (Inah and Onadeko,1997), folkloric medicinal values of body parts of wildlife species (Onadeko *et al., 1989),* Wildlife predators in fish pond investments (Onadeko *et al., 2000),* wildlife pest in agricultural farms and farm wildlife management (Onadeko *et al.,* 1989) and holistic public relation, designs for wildlife management (Onadeko and Meduna, 1984).

The greatest wildlife problems are certainly in the field of human relations. Lack of adequate research information of the public in relation to wildlife conservation efforts, the perceivable indiscriminate use of wildlife resources, and habitat degradation due to human activities form the basis for the serious attention devoted to studies on the human-related issues of wildlife. Illegal trapping, hunting, capture and killing (poaching) are major problems (Onadeko and Meduna, 1984). Managing the rural public is considered to deserve as much as 80% of all efforts in wildlife protected area management (Onadeko, 1989). Law enforcement problems are greater in wildlife management than in forestry and other allied professions (Gilbert,1971; Thorsell, 1984). It has been severally argued that wildlife management cannot function without public support, or at least public sufferance, and that the development of favorable climate of public input must accompany or even precede the management of game. Olawoye and Ajayi (1975) lamented the absence of organized and scientifically controlled scheme for bush-meat production and marketing in Nigeria. The exact public that are culpably guilty of illegal collection of wild living resources were in the final analysis concluded to comprise a vast majority of the overall Nigerian public (Onadeko and Meduna, 1984). The conclusion that almost everybody is a poacher was drawn from the fact that even though many people would not personally go out to hunt wild animals (as active perpetrators), they are in reality poachers by connivance or attitude (passive poachers). Many of the illegal hunters are encouraged to continue their illicit trade by well-placed Nigerians

who patronize the illegal sales of bushmeat at the present unsustainable commercial level.

Massive and innovative strategies of public relation towards wildlife and biodiversity necessitated the categorization of the public viz:

(i) The antagonistic public
(ii) The supportive public
(Hi) The neutral public (Onadeko and Meduna, 1984).

Everyone involved in any offensive and obnoxious activity toward wild living resources leading to habitat degradation and unsustainable use belong to the **antagonistic** public. The **supportive** public comprised people who are against any act that is inimical and injurious to the well-being of nature. The **neutral** public includes children and adults who are yet to make up their mind about the use of wild living species and who are ignorant of the implications of any unbecoming relationship against the wild animal species and their natural settings. Approximately 51% of hunters and bush-meat dealers evaluated, disclosed that they cannot stop killing and dealing in bush-meat because it is their main source of income. A higher proportion (78%) further opined that because of the income accruing from bush-meat trade, the risk is worthwhile.

Much-needed socio-demographic information for holistic public relations for wildlife management include attitude, perception, belief, culture tribe, religion, history, language and custom and level of literacy. Efforts to affect beliefs would require working with the belief system. A significant cultural truth was revealed during a field survey and face-to-face interview of some local people at Luma Kuble and Babana (three of the Villages on the boundary of Kainji Lake National Park in Niger State (then Kwara state), giving insight into why the rural communities have been

unrepentant of their negative activities against the park. Most of the people occupationally poach to feed their family and for commercial purpose, while a few minority poach for sports. Very important, however, is the fact that it is mandatory in these communities for a man to fulfill some hunting obligations before they can qualify to take their first wife. The man aspiring to take a wife must prove himself to be a strong and clever hunter, indicative of one who will be able to fight wars. This is also necessary for the bride to have a full confidence in the man's ability to protect her.

The requirement for each aspiring husband is the killing of a three roan antelopes *(Hyppotragus equunus)* and four buffaloes *(Syncearus cafetJ,* thus making the aspirant a killer of seven strong beast. In addition, he must also have killed one lion *(Panthera leo),* one cheetah *(Acynonix jubatus)* and a male baboon *(Papio anubis)* and rare birds. This perhaps exemplifies the roles that culture has played in the future of already endangered or almost extinct wildlife species such as cheetah (the fastest land animal, 120kmjh), leopards and rare birds like the ostrich in the Nigerian fields (Onadeko and Meduna, 1984; Onadeko, 1989).

Reactions to change agent systems were evident in an evaluative study of the roles of park/equivalent game reserves in rural development. Negative feelings and attitudes towards park management programmes and activities were already observed. Prominent complaints include usurpation or deprivation from former areas of land use by the park, complete loss of hunting and fishing right, inaccessibility to traditional worship sites (Onadeko, 1987)

Wildlife Habitat Issues

Wildlife management is first and foremost habitat management because habitat is critical to the perpetuation of wildlife. According to Taylor (1978). It is not only important to document changes but also to relate change to wildlife population. The ecological interactions of wildlife species with habitat elements, habitat conditions and occupancy and the effects of habitat changes were demonstrated in various studies.

The state of vegetal cover has significant effects on the ecological distributions of wild animals (Cobb, 1975). Immense wildlife displacement is shown in Table 13 as a result of temporary or permanent changes in the vegetation due to fire in a Guinea savanna vegetation. A total of 115 animals comprised of Red-flanked Duiker *(Cepha/ophus ufi/atus),* Oribi *(Ourebia ourebl), Grimmia duckier* (Sylvicapra *grimmia),* Hare *(Lepus crawshaYI),* Cane rat *(Thryonomys swinderianus),* Ground squirrel *(Xerus erythropus),* Mongoose *(Herpestes sanguineus),* Baboon *(Papio anubis),* Civet cat *(Viverra civetta)* Owl *(Otus scops),* and Skink *(TJ'liqua seine/odes)* were recorded in un - burnt thickets while 12 animals comprised of Grimmi's duikier, Hare, Cane rat, Ground squirrel, Mongoose, and Baboon were in an almos~~ontiguous vegetation that has been ravaged by incessant annual fires. What constitutes a cover varies from one species to another (Dasmann, 1981).

Table 13. Animal activities by direct sightings and indices after annual fire in a Guinea Savanna Study Site

SPECIES	UNBURNT THICKETS	METHOD	BURNT AREAS	METHOD
	Number of animal sighted	By indices	Number of animals sighted	By indices
Red flanked Duiker *(Cephalophus rifulatus)*	8	Droppings, Footprints	-	-
Oribi *(Ourebia oureb;)*	3	Droppings, Footprints	-	-
Grimm's Duiker *(Sylvicapra arimmia")*	6	Droppings, Footprints	1	Footprints
Hare(Lepus crawshaVl)	13	Droppings	2	Droppings
Cane Rat *(Thryonomys swinderianus)*	54	Droppings, Feeding activities	3	
Ground squirrel *(Xerus erYthroDl1s)*	7	Live holes	3	Dormant holes
Mongose *(Herpestes sanguineus)*	5	-	2	-
Baboon *(Papio anibis)*	2	-	1	-
Patas Monkey *(Cercopithecus patas)*	-	Abundant Feeding Activities	-	Scanty feeding activities
Bush Buck *(Tragelapus scriptus)*	-	Droppings and browsing	-	-
Civet *Cat(Viverra civetta)*	-	Droppings	-	-
OwllQtus SCQDS)	1	-	-	-
Skink(*Tiliqun scinciodes)*	1	-	-	-

Source: Onadeko *et al.*, 1998

Specific activity locations of many animals are indicators of the living requirements of the animal species. Habitat elements, life requirements, key species utilization and basic living areas have been shown to differ sufficiently in different localities (Vessey-fitz Gerald, 1960; Riney, 1982; Dasman, 1981; Onadeko *et al., 1999;* Onadeko and Odutola, 2002).

Habitat occupancy and feeding activities of the grasscutter in the derived savanna vegetation showed mixed grass, forb and shrub sites to be intensively used while tall perennial grasses and the riparian valley sites were most extensively used. Mean distance between activity centres was 17.73 ± 2.83 meters. The differences between the mean distance of activities centres in various sites were significant ($p<0.01$).Habitat occupancy and food choices varied according to sites. Ranked order of food choices or preferences (highest to least) was *Andropogon tectrur(94), Penicum maximum(41), Zea mays(32), Iperata cylindrica!:')*9) *Manihot utilisima(1)(* Mbah, 1989; Onadeko and Odutola, 2002).

Interactions between floral and fauna communities within their physical environment certainly create the pathways of energy flow leading to a clearly defined trophic structure (Huxley and Houten, 1997). For wildlife management, relative abundance, similarity, and diversity indices were used to demonstrate species richness of various sites while ecological interactions between plants, animals and other key habitat elements have been explored through the use of detrended canonical correspondence analysis (CANOCO, Ter Braak, 1988) often referred to as ordination and multivariate analysis. Various studies in different sites of the derived savanna showed grasscutter (*Thryonomys sWinderianus)* as the commonest species of wildlife based on relative abundance, thus affirming diverse sources of data from hunters' returns (Amubode and Agossa, 1985; Onadeko and Ojo, 2001; Onadeko and Amubode, 2002; Onadeko *et al.,* 2002). Table 14 shows Simpson's

similarity indices of wildlife animal abundance in derived savanna vegetation. Values in the lower diagonal are the Simpson similarity indices. The upper diagonal shows the number of animal species common between adjacent zones. The indices which can be taken as correlation between the zones indicate that zones 3 and 6 are similar by 83.3%, zones 1 and 6; 3 and4; 4 and 5; and 5 and 6 had values of 66.7%. No two zones have index less than 50%. These results indicating a continuous gradient in the distribution of animals within the study sites. Figures 3 and 4 are the bi-plots of animal and plant species and also of the animal species respectively. The direction of each arrow indicates the position of optimum abundance of the animals in relation to the plant species. It also indicates under normal circumstances the plant species most preferred by the animals hence the preferred habitat and niche. The correlations between wildlife species and the habitat are very important in the understanding of the habitat needs of wildlife species or community.

Table 14. Simpson's similarity indices of animal abundance at the University of Agriculture permanent site, Alabata, Abeokuta. Figure in the lower diagonal are the Simpson's similarity indices. The upper diagonal shows the number of animal species common between adjacent zones

	Zones					
Zones		1	3	4	5	88
	1	.	10	7	8	8
	3	71.4	.	8	14	10
	4	58.3	66.7	.	8	6
	5	57.1	77.8	66.7	.	8
	6	66.7	83.3	50.0	66.7	.

Source: Onadeko *et al.*, 2000

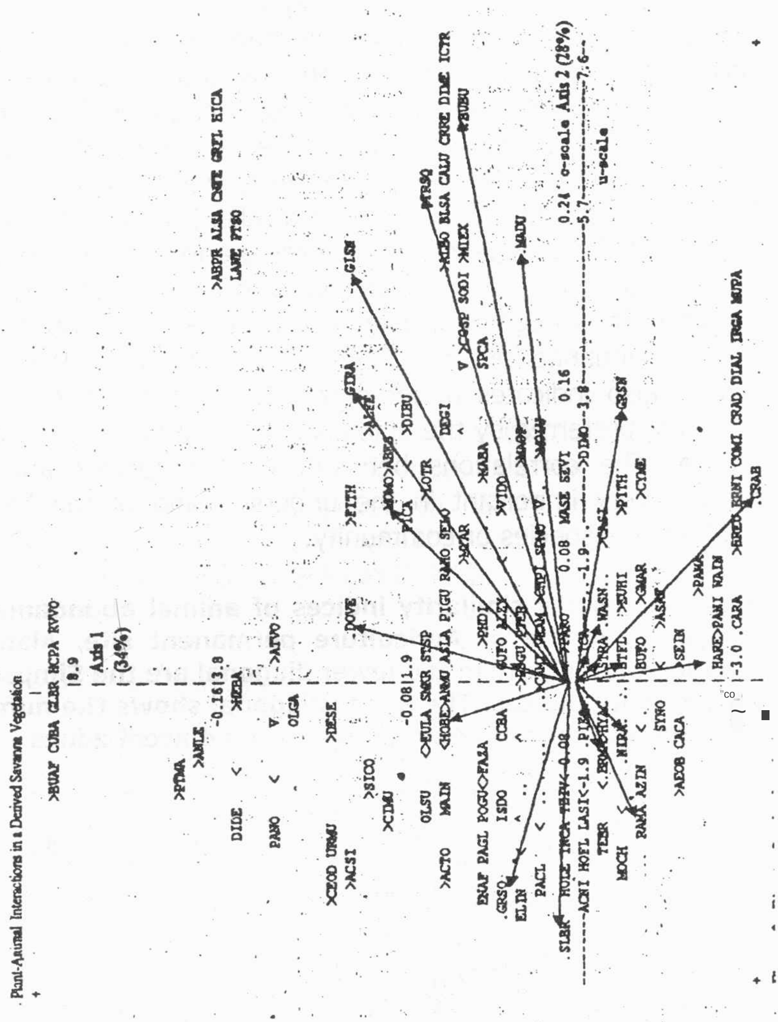

Fig. 3. Biplot of animal and plant species at University of Agriculture, Abeokuta permanent site based on Detrended Canonical Correspondence analysis

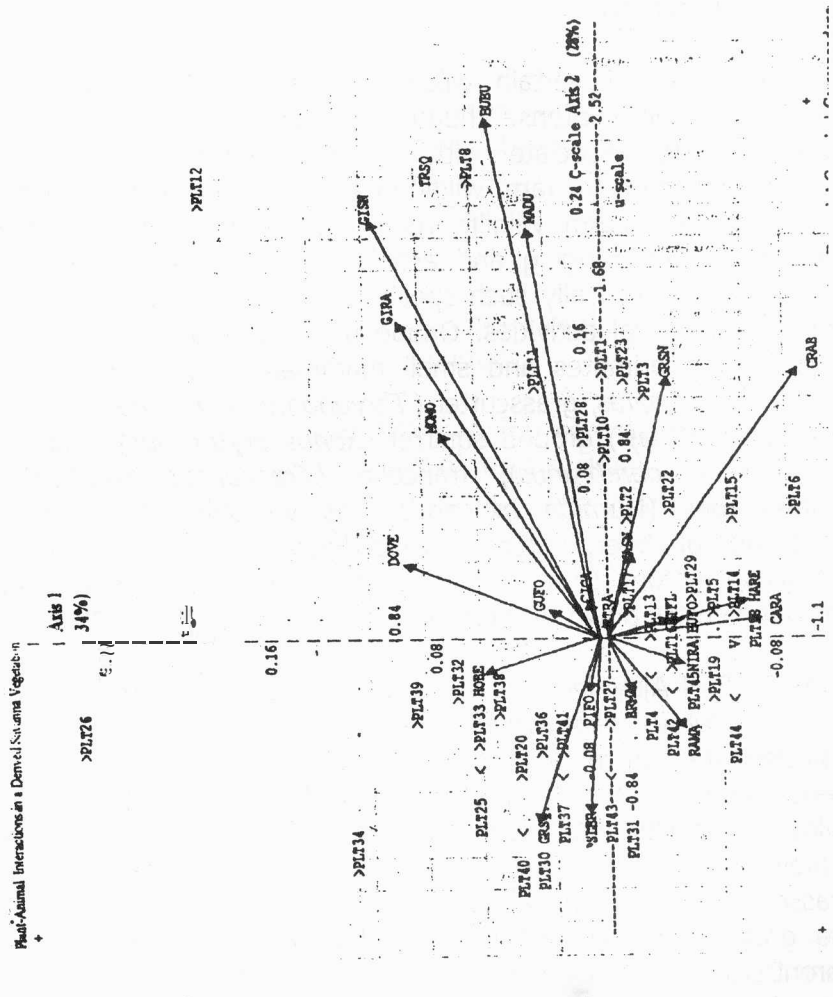

Fig. 4. Biplot of animal species at University of Agriculture, Abeokuta permanent site based on Detrended Canonical Correspondence analysis

Wildlife Farming

The capability of certain wildlife species to get around and multiply despite intense hunting pressure, as well as the innateness to associate with human habitation provide an important feature for farm wildlife management, wildlife ranching and farming. Farm wildlife refers to wildlife species; whose historical home ranging and activity centre largely encompass farm lands. Historically such species have always conflicted with man's agricultural activities. Onadeko *et al./* (1998) listed some medium-size primates and small mammals, and birds such as *Erythrocebus patas,* grasscutter *(Thryonomys swinderianus),* Hare *(Lepus crawshayl)* ground squirrel *(Xenus erythropus),* giant rat (Cricetomys *gambranus),* francolin *(Francolinus bica/car/us),* Guinea fowl *(Numida* meleagris), as valuable farm wildlife. Avalaibility of cover, water and food during dry season are major restrictive factors for farm wildlife. Hare has proved to be highly difficult to track down for domestication (Onadeko et al., 1998).

In 1972, Prof Ajayi initiated the domestication of the African giant rat *(Cricetomys gambianus)* and the grasscutter *(Thryonomys swinderianus).* In this and succeeding years, significant advances were made with welfare requirements of the animal in captivity following docility and acceptance of man. More emphasis and achievement were however retorded for the giant rat than the grasscutter. The need to provide adequate rearing guidelines for the grasscutter was initially bedeviled by regular mortality of parent stocks in captivity as well as improper understanding of the reproductive ecology of the grasscutter. In spite of the draw back, attempts were made to maintain parent stocks and to multiply the stocks through paired mating techniques. Amubode *et al., (1985),* Amubode and Oduro (1989) had at several times attempted to investigate some physiological phenomena of the grasscutter but no conclusive reference was made to the reproductive ecology of the grasscutter.

Rather than by trial and error, the captive propagation of grasscutter requires a scientific method of sex and age determination which would permit estimated ages to be assigned to selected individuals. More importantly, a gross morphology is required to characterize the sexes of the grasscutter as it continued to constitute a bottle - neck in the population dynamics of the rodent species because grasscutter is not sexually dimorphic. There are also evidences from literature on the relationship between body measurement and ages of ungulates but none is available for the grasscutter.

These enormous challenges informed the commencement of my studies on various aspects of the reproductive ecology of the grasscutter. Grasscutter farming is becoming a success story in Nigeria. The grasscutter has been described as the farm animal of the future in all the West African sub-region (Mensah and Baptist, 1986; Onadeko, 1999). It is already being referred to as mini livestock- that is small animal species being used for food, feed or source of revenue. However, it is not recognized by animal production specialists trained in industrialized countries and often officially ignored by the livestock services of their home areas, even though their meat, often considered bushmeat or game meat may be appreciated and command a high price than that of more conventional animals.

Morphological features are the best indices for sexing and aging wild animals. Arising from gross body morphology, six key indices (head, the position of the external genitals, teat, vulva, the penis and the testis) were characterized in grasscutter such that would-be grasscutter farmers will be able to successfully pair and breed the rodents (Onadeko, 1997) (Table 15). Figures 5 and 6 shows the position of the genitals in male and female Grasscutter.

Table 15. Indices for male and female sex identification in grasscutter

Male			
Characters	**Adult**	**Sub adult**	**Juvenile**
Brownie pubic patch	Present, widespread scaly, rough	Present faintly, Limited area, not rough, no scale	Absent
Scrotal Patch	Clearly present	Outline faintly present	Absent
Testicles	Bulges	Not pronounced	Outlined faintly
Penis	Sturkyand brown, shoots out of sheath with ease. Has bone at the tip	Less Sturky. Shots out of sheath with ease, light brown, bone present but smaller.	Comes out with much difficulty, No bone.
Female			
Vulva	Present flabby, Wrinkled	Present, clean just opened	Absent
Teat	Rough, ringed not obscured by hair, sometimes raised at 45° and distended	Not rough and ringed, well grown but flattened.	Hidden inside thick hair not raised, small and not fully grown.
Ventral hair	Not so thick, can see the skin	More ventral hair than adult	Thick ,cannot see the abdominal skin

Source: Onadeko, 1997

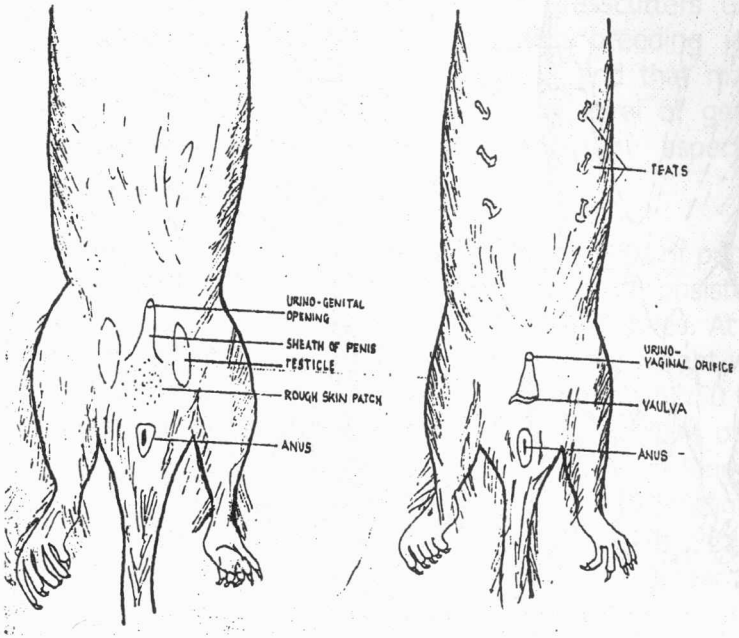

Fig. 5. Normal position of genitalia in male and female grasscutters
(Source. Onadeko, 1997)

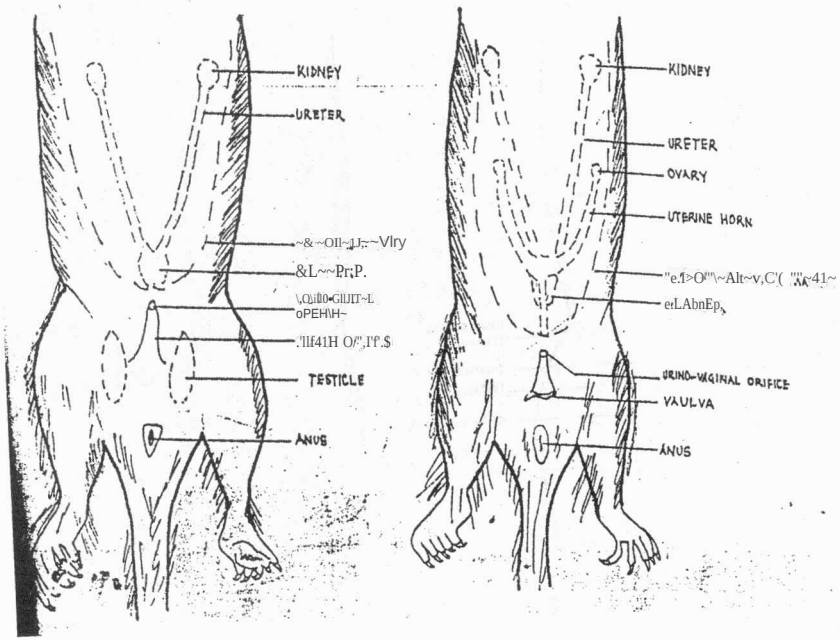

Fig. 6. Normal position of genitalia in male and female grasscutters
(Source Onadeko, 1997)

Table.16 shows the linear separation of the urinogenital protuberance and anal opening of the grasscutter.

Ratios between sexes and ages of individual are among the fundamental properties that could affect the management of game species and the relative size of each age-class of male and female will also help to determine age-specific rates. Sex ratio of field captured grasscutters was 48% males to 52% females. Grasscutter bred in captivity recorded 44% males to 56% females.

Age-sex composition generally showed more females than males in all age classes (adult, sub-adult and juvenile) (Onadeko and Amubode, 1998). The narrow sex ratio of grasscutters either captured from wild or resulting from captive breeding is an indication that the animal is not monogamous and that mating partners are not rare. It also ensures a high level of genetic diversity in the species which is an important aspect of biodiversity conservation.

On body weight changes, morphometry and attainment of puberty in captive bred grasscutters (Onadeko, 1999) males consistently showell higher rates of live weight gain than the females. At 36th week, a male grasscutter had attained 1.6 kg live weight while a female was 950 g. Mean puberty was estimated at 252.50 days for male and 214.67 days for female. With the exception of the shoulder height at birth, body linear measurements were longer in the male than the females and consistently increased throughout the study period. The relationship between each morphmetric index and body weight was significant ($r<O.Ol$) linear and strongest($r = 0.93$) between body weight and heart girth.

Gonadal and extragonadal sperm reserves indicated poor spermogenic capacity (Table 17) which had earlier been manifested in poor ejaculation despite good response to electro-ejaculation of the grasscutter. Relationship between testes weight(Y) and body weight(X) was linear: $Y = 1.31 + 0.73x$ and significant (Onadeko, 2001).

In all, managerially useful data were provided from various studies on the grasscutter. The available data on the captive rearing of grasscutter have set the stage for further research. Already the conventional animal scientists, breeders and farmers are already directing greater interest and attention ever than before on this unconventional mini-livestock species. It is clear from the series of systematic investigations undertaken on the

captive rearing of grasscutter that sustainability in the utilization of wildlife species for bushmeat can be attained among other means through the rearing of grasscutter and other similar small-sized mammals that are prolific, tractable and easy to handle in both in -situ and ex-situ rearing management programmes.

Table 16. Linear separation between urino-genital protuberance and anal opening of grasscutter (em)

		Study Centres			
Age group	Sex	Asejire	Idi-Ayunre	Kila	Mean
Adult	M	3.32±0.04	3.33±0.03	3.36 ± 0.03	3.33 ± 0.02
	F	0.51±0.02	0.50±0.002	0.50 ± 0.004	0.50 ± 0.003
Sub adult	M	2.87±0.04	2.90±0.003	2.87 ± 0.03	2.88 ± 0.04
	F	0.47±0.003	0.48±0.002	0.47 ± 0.005	0.48 ± 0.003
Juvenile	M	2.02±0.05	2.33±0.04	1.95 ± 0.06	1.99 ± 0.04
	F	0.46±0.004	0.45±0.04	0.44 ± 0.003	0.45 ± 0.00

Source. Onadeko, 1996

Table 17. Sperm reserve in the gonadal and extragonadal portions of the adult and sub - adult grasscutters

GONADAL PARTS	AGE GROUP	
	ADULT	SUB-ADULT
TESTES (x 10^5)	4.43± 0.71(1.75 - 7.5)	1.95±0.33 (1.5 - 3.25)
EPIDIDYMES(x10^5)	10.2± 2.38 (3 - 28.75)	6.9± 2.04 (3.5 - 10)
VAS DEFERENS(x10^5)	0.19± 0.01 (1.5 - 2.5)	0.09±0.004 (0 - 2)

Source: Onadeko, 1996

Conclusions And Continuing Efforts

Mr. Vice-Chancellor Sir, in the course of this lecture, I have attempted to present a global picture of wild living resources and natural habitats that are under serious threat.. Changes to the landscape and natural home range as a result of human activity have put many unique species and key ecological communities and processes at risk. Unsustainable consumptive uses are resulting in environmental devastation, depletion of valuable resources and a massive extinction of species. The phenomeQal growth in human population has overburdened ecological and social systems. Thus, the basic.foundations of global security are seriously threatened. The environmental signals are frightening yet the impending dangers of humanity destroying all interdependent and fragile forms of life on the planet earth, including himself can be avoided. Human society has frequently failed in its part because of t~e wrong perception that every natural resource element around is for his survival and wealth alone. Man's actions often- tend to suggest that everything is responsible to him and he is not responsible to anything until the consequence of his actions extremely portends some adverse effects. Future generations will certainly inherit the results of the present perilous trends and actions if nothing radical is done.

Ever than before fundamental changes are needed in our values, institutions and ways of living. The *Homo sapiens* needs to live with reverence for the mystery of being, gratitude for the gift of life and humility regarding the human race. The basic principles of the Earth Charter affirms that humanity ,has the knowledge and the technology to reduce the present impacts on the environment.

This comment from Cowman (1968) encapsulates much and I quote "The plants and animals represent the accumulated histor Y of millions of years of evolution. Each is the repository of a wealth of genetic novelties of unrealized potentiais. Their lives, processes

and relationships are imperfectly known and have not yet yielded their quota to the enrichment of human understanding. Concern for the effective custody of these often unique and fragile wild species is the responsibilities of the human society controlling the lands upon which these species live. It is exercised on behalf of all mankind today and tomorrow".

Frankly speaking, Mr. Vice-ChancellorSir, distinguished Ladies and Gentlemen, Gentlemen of the Press, and Students, by this lecture, it is my sincere wish that we all begin to ecologise. Ecology from its word derivation means the science of house keeping. This implies taking up some responsibilities concerning the environment that we live in. Everything in the natural environment is connected to everything and ecology with which every region is endowed is the basis of human life. To ecologize is to be cognizant of the relationship between ourselves, other people, animals and plants and their surroundings. When ecologising becomes a virtue in each of us (both great and small) the problems of unsustainable uses of the environment devastation and depletion of renewable resources will not be of such global significance as it is presently. We will not look kindly or connive with any act that is inimical to the ecological integrity, health and wealth of ecosystems.

Special concern for biological diversity and the natural processes that sustain life must be pursued, which includes safeguarding viable nature and biosphere reserves, promoting the recovery of endangered species and ecosystems and at all levels, adopting sustainable development plans and regulations that make environmental conservation and rehabilitation integral to all development initiatives. Also at all levels of decision-making, the cumulative, long-term, indirect, long distance and global consequencesof human activities must be continually addressed.

Education plays a key role in shaping the use of resources for sustainable development. People must be educated on the issue of faithful stewardship of the environment. A clear understanding of the meaning, function and applic2tion of the different kindred terms (conservation education, environmental education, park interpretation, wildlife extension and public relations) for educating different levels of people becomes a necessity. **Conservation education** is an inter-disciplinary field that ensures information of vital importance to human health and environmental protection, including genetic information, water, soil, forest products and marine life, remains available to the public. It is the best use of human resources for sustaining the environment and it empowers every human being with the education and resources to secure a sustainable livelihood. **Environmental education** is a program geared toward developing a world-citizenry that is aware of and is concerned about the environment and its associated problems. In origin, it is directed at schools (primary, secondary and tertiary institution) by introducing into syllabi and curricula, topical issues of environmental ethics to stimulate in the students at all levels (who are leaders of tomorrow), the awareness of the need for conservation and environmental protection on a sustainable yield basis. This is still a missing link in Nigerian educational system and the development of human resources in this country. For now, environmental education forms the bedrock for the launching of conservation clubs in schools but every club membership is optional. In fact only few schools in the whole federation has any such club called conservation club. **Park interpretation** is an educational activity aimed at park visitors and users to reveal meaning and relationship through the use of origfnal objects, by first hand experience and illustrative media rather than simply to communicate factual information.

Natural resource extension services (including wildlife extension) provide the educational and information linkages that

enables the public to know their benefits and services available to them as well as participate in the development of facilities and services that will directly address the needs of the people in relation to the resource base. **Public relation efforts** in natural resource conservation and development bring together as a management tool, the various components of the massive and innovative strategies of education (including all the afore mentioned) and reaching out to create positive image of the institution or organization responsible in the management of the natural resources.

All the above involve more than mere awareness th~ugh radio jingles and 1V documentaries. Though not largely directed at captive audience, a formal education and conscious efforts and investments at educating the public are much needed. Prof. N. Alao, former Vice-Chancellor of University of Lagos once said, and I quote," it is clear that we must go beyond awareness to institution of customers, with educational programmes that would ensure that environmental deterioration can be arrested and the stability of ecosystem assured".

It is now common knowledge that the reason for the poor local participation and cooperation in conservation efforts include lack of community-based involvement in matter of wildlife conservation planning, programming and development for the locality; lack of incentives, inability to perceive benefits of the project and lack of transparency on the part of the local project implementation team or committee. The local people who are the guardians and custodians of the resources must be carried along at every level of resource development to know "what is being done", "where it is being done", "how it is being done" and "why it is being done".

Alternative solutions to unsustainable consumptive utilization of wildlife resources include bee-keeping, snail-rearing, domestication and mJltiplication of tractable, prolific, and easy to

handle rodents such as the grasscutter, giant rats as well as growing mushroom. Wildlife production through captive rearing and breeding, in an intensive, semi-intensive and extensive husbandry systems will reduce hunting pressures for bushmeat from the wild. Breeding of endangered or extinct species in zoological park gardens where few species still remain will enhance possible re-introduction of species to their native range areas. Habitat protection and restoration are much-needed for wildlife population rehabilitation and recovery. Existing afforestation projects utilize exotic plant species such as neem *(Azachiractha indica),* Eucalyptus *(Eucalyptus spp,* Teak *(Tectona grandis)* and gmelina tree. *(Gmelina aborea)*

The exotic species have been found to be of very little value to wild animals. To achieve desirable wood production as well as favor wildlife species occurrence, more attention should be directed at breeds of indigenous species for plantation.

Further continuing efforts should be devoted to effective law and policy, provision of equipment (vehicles, radio links and binoculars) for effective and efficient anti - poaching programmes and field operations, proper demarcation of buffer zones, roads and network systems leading to remote locations, location of visitors' facilities outside the reserve, staff training and employment of qualified staff and most importantly the establishment of more wildlife and biodiversity reserves. As at today, there is no single Wildlife Reserve or a Zoological Garden in Ogun State. As an "OgunState indigene I am not complaining to the Governor but I am very sure that one of the few places where Sitatunga- *Tragelaphus spekei* (Yoruba- "Agbalangbo") still remain is Ogun State. I trust our beloved Governor, affectionately referred to as OGD; he will build more domestic homes and invest as well on the building of the non-human home on the range.

Thank God

Blessed be the Lord God, the God of Israel who only does marvelous things and blessed be His glorious name forever. Let the whole earth be filled with his glory. Amen and Amen (Ps.72:18, 19).

I thank God for everything I am, - for creating me. I thank Him for everything I have, - for providing all my needs. I thank Him for everything that happens to me, - for grace to be His child. Everything I have ever been is by His grace. I have thrived more than any person on God's saving grace, enabling grace, strengthening grace, healing grace and sustaining grace. I'm a child of grace. I thank Him for making me a Professor; academically professing Wildlife Conservation and Management and spiritually professing His sustaining grace to all creation; professing life in Christ; professing eternal life for every man; professing life so rich and abundant, joy so full and triumphant and professing peace through God that nothing can mar and nothing can take away. I give God all thanks, I give Him praise. Amen and amen.

I thank God for my parents of blessed memories; they have gone to their perfect silence and rest but their works live on. Today, I remember them both-Pa Erukena (i.e. Pa Elkannah natively pronounced)- a methodist man per excellence, He has been my motivation in following hard after God and my mother popularly known as Mama Onipanla- an intelligent arithmetician though not lettered, May their works live forever. I thank god for my siblings-full sib and half sib. From my father we are 15 and from my mother we are 7. Particularly, I thank God for Pa J.A. Banjo, Mrs. F. O. Onakoya and Sir E.O.Onadekofor their encouragement and support.

Appropriately here also, I thank God for my in - laws, Lawyer J.A. Adeyemo of blessed memories and Madam Matilda Olalounpe Adeyemo who just turned 80 this month.

I thank God for my teachers in Methodist Primary School, Ode-Remo; I remember Messrs Oyesanya and Dehinsilu to represent all of them. I thank God for my teachers in Ago-Iwoye Secondary School: Mr. O. Asenuga (a recently retired Ogun State Director of Education) and Late Mr. Adesegun and others. I thank God for my classmates in the secondary school ably represented by Prof. Bola Okuneye here in UNAAB. I thank God for my lecturers in the University -Prof S.S Adeyoju (Professor Emeritus), Prof. N.O Adedipe - the founding V.c. of UNAAB, Prof D.U.U. Okali, Prof. T. O. Tayo (DVC,UNAAB), Prof. S. S. Ajayi (UI), Prof. T. A. Afolayan (FUTA) and Prof. Jack Inglis (Texas A&M) to name a few and very specially I remember my Ph.D supervisor of blessed memory Late Prof. Felix. O. Amubode. I humbly request that we rise for a minute silence to remember a dear friend, a loving senior colleague, and a perfect gentleman. At this point also, I remember to thank God for my other professional colleagues. Prof S.O Bada - A very senior colleague for his good wishes and assistance. I specially thank God for my other two Professors of Wildlife Management - Prof 1. Ayodele (UJ) and Prof Yomi Agbelusi (FUTA). I also thank God for Mr. C.F.A.O Adebagbo, Dr. Bola Oyeleye, Dr. Onyeanusi and Dr. MJ Meduna - all of Forestry Research Institute of Nigeria.

I thank God for the Foursquare Gospel- a foremost and great movement for gospel work in Nigeria. I thank God for the General Overseer of the Foursquare Gospel movement- Rev.Dr. W. A. Badejo and his wife for the opportunity given to me to serve God in the Church. I thank God for the District Overseer of the Four Square Gospel Church, Abeokuta District - Rev. D. O. Ibidun and his wife -- dynamic servants of God and city - shakers for Jesus Christ. I thank God for all Ministers of the Gospel within and

outside of Foursquare who are present here for fellowship, encouragement and comfort in the ministry. I thank God for my brethren and entire membership of Ita- Oshin 1 Foursquare Church. Some of them are here in UNAAB-Prof. Ishola Adamson and Prof (Mrs) Adenike Addo. I thank God immensely for a very faithful deligent personal assistant, Mr. 'Segun Odeyemi.

I thank God for my Colleagues in my College- the College of Environmental Resources Management and specially my Dean Prof. O. Martins for encouraging me to take up the inaugural lecture. Also, my immediate past Dean and Oracle of Forestry in UNAAB, Prof. B. A. Ola-Adams for support and provision of material in my preparation for this lecture. I thank God for my colleagues in the Department of Forestry and Wildlife Management for the help, encouragement and support I enjoyed from them all these years of working together. I thank God specially for Dr A.O Adeola, Dr. Aduradola and Dr. L.O. Ojo for all their encouragement and support. And much thanks to God for Dr. Sam Oluwalana - an old friend, brother and colleague. I gracerat1y-give thanks to God for an eminent forester and immediate past Vice Chancellor, Prof. Julius .A. Okojie. Also for my kinsfolks in Wildlife Management Drs. Inah and Smith, and Messrs Oyatogun, Shotuyo and Akintunde.

Mr. Vice Chancellor Sir, I thank God for you, for excellent leadership and humility and for opportunity to deliver my inaugural lecture. He is a pastor an~a very special friend. May you increase more and more and may your shadow never grow less.

Finally, I thank God, I thank God, I thank God for my dear wife, my sweety pie, Pastor(Mrs) Aderonke Abimbola Onadeko, a Deputy Director in the Federal Ministry of Education for her love, warm embrace, unflinching support and prayers for the past 27 years of marriage. On Occasions like this I have a special card I

always draw out for her - "A[1] wife" and for the beautiful children that God has blessed us with:

Kemi	–	my special daughter
Seun	–	my first lady
Folake	–	Small but mighty,
Akin	-	King David
Dami	-	Damily the white lady and
Tomiloba	-	Papa.

Last but not the least, I want to appreciate someone very special and important to me and that is You. Thank You

Kindly join me to sing before we go into the recession

Oluwa ese anu yin duro

Oluwa ese anu yin duro
Tori pese anu yin duro
Tori pese
Tori pese ese o Saba
Tori pese anu yin duro

REFERENCES

Afolayan, T.A. 1987. Man's Inhumanity to Nature: The over- exploitation of wildlife resource. Inaugural Lecture series 3 Federal University of Technology, Akure.

Agbelusi, E.A., Ogunjemite, B.G. and Owolabi, O.O. 2000. Utilization Pattern and Conservation of Primates in Ondo and Ekiti State Nigeria. The Biological resources and sustainable management. UNESCO, France.

Ajayi, S.S. 1971. Wildlife as a source of protein in Nigeria: Some priorities for development. Nigerian Field, 36 (93): 115-127.

Ajayi, S.S. 1974. The biology and domestication of African giant rat *(Cricetomys gambianus* Waterhouse) Ph.D. Thesis. University of Ibadan, Nigeria.

Ajayi, S.S. and Tewe, O. 1979. Performance of the African giant rat *(Cricetomys gambianus* Waterhouse) on Commercial ration and varying dietary protein levels. J. Lab. Animals (London), 12: 109-112.

Alabi, K.A. 1992, Traditional Forest Conservation in practice: A case study of Ikire - lie in Ola - Oluwa Local Government. M.Sc Degree Dissertation, Department of Forest Resources Management, University of Ibadan.

Alheritiere, D. 1979. Environmental Impact Assessment and Forestry Law. Unasylva. 31, (125): 25-31.

Allen, R. 1980. How to save the world, Strategy for World Conservation, Kogan Page Ltd, London, 150pp.

Amubode, F.O and Oduro. W. 1989. Performance and some nutritional indices in grasscutter *(Thryonomys swinderianus)* fed varying food combinations.

Amubode, F.O. and Agossa. A.S. 1985. Evaluation of hunters return as measure of wildlife utilization in Southwest Nigeria. The Nig. J. Forestry, 13(1&2): 91- 95.

Amubode, F.O., Offoriatah, A.P. and Ajayi, 5.5. 1985. Capture and rearing methods for grasscutter *(Thryonomys swinderianus),* in the hot humid tropics. Proc, 1985 FAN, Conf. Okojie and Okoro (ed.). 157 - 167.

Anderson, H.S. and Gutzwiller,J.K. 1994. Habitat evaluation methods: In Theodore.A, D. Bookhout (ed.). Research and Management Techniques for Wildlife and Habitat, p.592-606. The Wildlife Society, Bethesda, Maryland.

Anstey, S. 1991. Wildlife Utilization in Liberia. W.F IF.D.A Wildlife Survey Report.

Asibey, E.A.O. and Child, G. 1990. Wildlife Management for Rural Development in Sub-Saharan Africa. Unasylva.

Asibey, E.O.A. 1974. Wildlife as source of protein in Africa south of Sahara. Biological Conservation 6(1): 33-39.

Ayeni, J.S.O, Afolayan, T.A. and Ajayi, 5.5. 1982. Introductory handbook on Nigerian Wildlife. SAOLOG,Printing Production, Ilorin.

Ayodele, LA., Ebin, C.O, and Alarape, A.A. 1999. Essentials of wildlife Management Jachin Publishers, Ibadan, 88pp.

Baptist, Rand Menah, G.A. 1986. Aspect practiques on elevation d'amlocodes *(Thryonomys sWinderianus)* Rev .Elev. Med. Vet. Pays. Trop. 39(2) 239-242.

BCTF. 2003. The role of logging industry. American Zoo and Aquarium Association. Silver- Spring, Maryland.

Boaten, BAA 1998. Traditional Conservation Practices in Ghana's Example Biodiversity Conservation. Pro. Of the 3rd UNESCO/ MAB regional Seminar. cape Coast pl~6.

Brown - Jones, E., Brown, D. and Robison, E. 2002. Assessment of the solution oriented research needed to promote a more sustainable bushmeat trade in Central and West Africa. Report to the Wildlife and Countryside Directorate, DEFRA,DETR,UK.

Brown, D. and Williams, A. 2003. Some governance and livelihood issues relating to bushmeat trade. International Forestry Research Conference, U.K.

Clayton,L. and Milner- Gulland, EJ. 2000. The trade in wildlife in North Sulawesi, Indonesia. In: Hunting for sustainability in Tropical Forest (Eds.). Robson, J.G and Benett, E.L., pp473-496. Columbia University Press Network.

Cobb, S. 1975. Large Scale measurement of habitat structure and Conditions. Wildlife symposium, University of Ibadan.

Cowman, I.M. 1968 The ecological concept of park management. Proceeding of the symposium on Wildlife Management and Land Use. Special issue of the East African Agricultural and Forestry Journal. 173-177.

Dasmann, R.F. 198). Wildlife Biology. John Wiley and Sons. New York.

Datarri, S. 2002. Not much is left. Deccan Herald, India.

Defoliart, G. 1989. The human use of insects as food and as animal feed. Bulletin of the Entomological Society of America 35(1) : 22-25.

Devos, A. 1977. Game as food. Unasyliva, 29 (116):2-12

EltrIngham, S.K. 1984. Wildlife resources and economic development. John Wiley and Sons Inc. New York, 325pp.

Eves, H.E. 1995. Socio - economics of Natural Resource Utilization in the Kabo Logging Concession. Northern Congo. Wildlife Conservation Society. New York.

Eves, H.E. and Stein, J.T. 2002. Duikers and African bush-meat trade. Silver-spring Maryland.

FORMECU, 1996 Land use and Vegetation Study Report.

Gilbert, D.L. 1971. Natural Resourcesand Public Relations: The Wildlife Society, Washington.

Greenhall, A.M. 1982. House bat management. United States Department of interior Fish and Wildlife Service, Resources publication 143, Washington D.C. 33pp.

Hagan, G.P. 1997. Traditional Laws and Methods of Conservation and Sustainable use of Biodiversity. In: Biodiversity Conservation. Proc. Of the 3rd UNESCO/ MAB on Biosphere Reserves for Biodiversity: Anilalo, Atsiatome, L.D, and FiatLC. Eds. E.P.A1998.

Happold, D.C.D. 1987. The Mammals of Nigeria, Clarendon Press.

Hill, A. 1997. Examination of the practical use of manual tracking for monitoring the movement of forest elephants *(Loxodonta aficana)* in the Omo Forest Reserve. Nigerian Forest Elephant Group 8 pp

Holsworth, W.N. 1969. Wildlife management in Nigeria - United Nations development program report to the federal government of Nigeria, FAO (Rome).

Huxley, P. and Houten, H.V. 1997. Glossary for Agro forestry. International Centre for Researchin Agro forestry, Nairobi, Kenya. Pp78.

LU.C.N, 1993. Preserving wildlife and habitats in Saudi Arabia: LU.C.N, The world Conservation Union Bulletin No.3 1993.

I.U.C.N, 1996. Red List.

Inah, E.I and Onadeko, SA 1997. Human Persecution of Wild Animal outside Conservation Areas in Bauchi State, Nigeria. Nigeria Journal of Forestry. Vol. 27. (1 and 2) pp 55 - 61.

Isichel, A. O. 1995. Omo biosphere reserve: Current status, utilization of biological resources and sustainable management. . UNESCO, France.

Janzen, D.H and Martins, P.S. 1982. Neotropical Anachorism: The fruits Gomphoteres ate Science 2115:19 -27.

JGI (1999). Bushmeat: What can you do? The Jean Goodall Institute, Canada.

Malaisse, F. and Parent, G. 1982. Rodent of the Miombo woodland: A nutritional and ecological approach. Ecology of Food and Nutrition, 11:211-216.

Mbah, L.A.k. 1989. The influence of season and age of stand on the nutritive value of elephant grass *(Pennisetum purpurreum)* and sugar cane *(Sachanium officinarium)* fed to the cane rat *(Thryonomys swinderianus)* M.Sc Dissertation. University of Ibadan, Ibadan, Nigeria.

Mackinnon, J., Mackinnon, K., Child, G. Thorsell, J. 1986. Managing Protected Areas in the Tropics IUCN/ UNEP.

Milligan, K. 1978. An ecological basis for the management of Kainji Lake National Park, Nigeria. Ph. D. Thesis University of Ibadan.

Muchaal, P.K. and Ngandjul, G. 1995. Secteur Quest De La Reserve De faune Du Dja(Cameroon): Evaluation De La Chasse Villageoise Sur Les Populations 'Anumales Et Propositions D' Une Exploitation Rationalle. Republique du Cameroun Ministere de l' Environment et des Forets. Project Regional ECOFAC- Composante Cameroun.

NEST 1991, Nigeria Threatened Environment - A National Profile. Nigerian Environmental Study/Action Team, Ibadan. 288pp.

NCF Nigerian Conservation Foundation 1994. Teachers Guide to Conservation Clubs. Education Department. Lagos 57pp.

Ntiamoa - Baidu, Y. 1997. Wildlife and food security in Africa FAO (Rome).

Ogunjemite, B.G. 1998. A Preliminary survey of the primates of Ondo and Ekiti State. M. Tech Thesis. Federal University of Technology, Akure 66pp.

Ola-Adams, B.A. 1999. Resource utilization and sustainability: A dilemma in National Development. Inaugural Lecture presented on 12th May, 1999 at Oba Lipede Auditorium, University of Agriculture, Abeokuta. 79pp.

Olawoye, 0.0. and Ajayi, S.S. 1975. Highlights of the problems of bushmeat production and marketing in Nigeria. Federal Department of Forestry, Ibadan; Wildlife Bulletin No.3.

Omiyale, O. 1993. Study of forest policy in Nigeria: A case study of Ondo State Afforestation Project.

Oluwa 1968 - 1992. In; Forest for Urban and Rural Development in Nigeria; Proceedings of the 23rd Annual Conference of the Forestry Assoc, Resource use of Nigeria. Nov, 29 - Dec, 3, 1993, E.A.Oduwaiye, ed. p 53 - 62, 1993.

Onadeko, SA and Meduna, AJ. 1984. Public relations In Wildlife Management In Conservation and Optimization of Forest Resources. Proceedings of the 14th Annual Conference of the Forestry Association of Nigeria. 0.0 Okoro and SA Fuwape (Ed.) p.175 - 197.

Onadeko, SA 1985. Consideration for Location of Facilities in National Park Games Reserve settings in Nigeria. Proceedings of the 15th Annual Conference of the Forestry Association of Nigeria. J .A Okojie and 0.0 Okoro (Ed.)

Onadeko, S.A. 1987. Evaluating the Roles of National Park Equivalent Game Reserves In the Role of Forestry in a Depressed Economy. Proceeding of the Forestry Association of Nigeria A.B Oguntola (Ed.) pp173 -177.

Onadeko, SA 1989. Wildlife Extension Service and Facilities as Management Tools in Nigeria. The Nigerian Journal of Rural Community Development. 3 (l):p. 66-74.

Onadeko, SA, Adegbola, P.O. and Oladoyinbo, O.O. 1989 Consumptive utilization of wildlife resources in Oyo State. Proceedings of biennial conference of ECOSON A.N. Okaeme (ed.) 223-235.

Onadeko, SA 1992. The American Alligator and concern for visitors at Brazos Bend State park. Journal of Environmental Management. (1992) 35:p. 261-269.

Onadeko, SA, Meduna, AJ. and M.O Soladoye 1994. Conflicts between Fulani Graziers and Wildlife Resources Protection in School of Wildlife Area of kainji Lake Basin, Nigeria. Journal of Tropical Forest Resources .Vol. 9 and 10, pp 39 - 48.

Onadeko, S.A. 1996 The reproductive ecology of the grasscutter *(Thryonomys swinderianus* Temminck) in captivity. Ph.d Thesis. University of Ibadan. Nigeria

Onadeko, SA 1997. Sex and Age Determination of the Grasscutter *(ThJYonomys swinderianus* Termmick). Journal of Tropical Forestry Resources. 1 p.ll-80.

Onadeko, S.A and Amubode, F.O. 1998. Population structure of Grasscutter *(Thryonomys swinderianus* Termmick) in some Bushmeat Processing Centres Nigerian Journal of Forestry, 28 (1): 23-27.

Onadeko, SA Shotuyo, L.A. and Meduna, AJ 1998. Farm Wildlife Management; Observation on some Medium Sized Primates and small Mammals Nigerian Journal of Forestry. 28 (2):66-70.

Onadeko, SA, Oyatogun, M.O. and Meduna, A.J. 1999. Wildlife utilization of some Browse Species and Association Through Indicators Parameters in an area of the Kainji Lake Basin, Nigeria: Nigerian Journal of Forestry..29 (1):38-50.

Onadeko, SA 1999. Body Weight Changes, Morphometry and attainment of puberty in Captive - bred Grasscutter (Thryonomys swinderianus Termmick). Tropical Journal of Animal Science, 2 (1):195 -201.

Onadeko, SA, Ezeri, G.N.O. and Shotuyo, A.L.A. 2000. A survey of Wildlife Predators in Ponds in Three Local Government Areas in Ogun State, Aquafield Journal of Field Aquatic Studies. 40-47.

Onadeko, SA, Ojo, L.O. and Jaiyeola, O.A. 2000. Plant-Animal Interactions in a Derived Savanna Vegetation in Ogun State. Nigerian Journal Of Forestry. Vol. 30(2) pp 100 - 111.

Onadeko, S.A. 2001. Gonadal and Extra -gonadal Sperm Reserves of the Grasscutter *(Thryonomys swinderianus Termmick).* ASSET: An International Journal A(2002) 2(1):139 - 145.

Onadeko, S.A and L.O. Ojo (2001): Ecological Interactions of Plants and some Wildlife Species in the Northern Guinea savanna Vegetation of the Kainji Basin, Nigeria. The Nigerian Journal of Environmental Management.1.1 (1):55 - 64.

Onadeko, S.A and Odutola, O.A. 2002. Habitat occupancy and find feeding activities of the grasscutter (*Thryonomys swinderianus Termmick)* .In a derived Savannah vegetation in Abeokuta, Nigeria. , Journal of Tropical Forest Resources18(1) .

Onadeko, SA and Amubode, F.O. 2002. Reproductive Indices and Performance of Captive-Reared Grasscutters *(Thryonomys swinderianus Termmick)* Nigerian Journal of Animal Production. 29(10):142-149.

Onadeko, SA, Ojo, L.O.", Ogunjimi, A.A. and Jaiyeola, O.A. 2002. Response of avian species to environmental changes in c1 derived savannah in Abeokuta, Nige rja. Nigerian Journal of Ecology .4 (1):59-72.

Osibanjo, O. 1990. Pesticides residue monitoring. Seminar on ~sticides usage and Environmental Pollution. University, of Agriculture, Abeokuta. 25th - 2ih, June, 1990.

Papka, P.M. 2001.. Land use and Soil Degradation in Nigeria. In: Ojo, L.O and Adeola, A.O (eds.). Nigerian Biodiversity, Update. A symposium organized by FMENV- UNAAB Linkage Centre for Forest, Conservation and Biodiversity, 16th- 18th October, 2001 151- 180pp.

Peeters, M. and Delapote, E. 2002. Monkey meat: One Virus hides Another One. Coraf Action NO.25, 2002. p3-4.

Pestrides, G.A. 1965. Advisory Report on Wildlife and National Park in Nigeria. Special Publication No.18. American Committee for International Wildlife Protection. Bony, New York.

Pielou, E.C. 1979. Biodiversity, John Wiley and Sons, New York 351.pp 135 - 142.

Prescott-Allen, R and Prescott-Allen, O. 1982. What's Wildlife Worth. International Institute for Environment and Development London.

Redford, K.H., Godshalk, R. and Asher, K. 1998. What about the Wildlife Animals. FAO Rome.

Riney, T. 1982. Study and management of large mammals; John Willey and Sons, Singapore.

Robson, J.G and Redford, K.H. 1991.. Subsistence and Commercial use of wildlife,in Latin America. Chicago University, Press, Chicago.

Rose, A.L. 2001.. Bushmeat, Primate Kinship, and the Global Conservation movement Klblwer Press, New York.

Rose, A.L. 2002. Conservation must pursue Human Nature Biosynergy in this era of Social Chaos and Bush-meat Commerce. In: Conservation Implications of Human and non - human Primate Interconnections. cambridge University, Press.

Rose, A.L., Fraser, P. and Lysinge, R. 2004. Change People In order to Save Gorilla. 2004 Gorilla Conservation.

Sale, J.B. 1981. The importance and values of wild plants and animals in Africa. Gland SWitzerland; IUCN.

Stein, J.T., Bailey, N.D. and Wade, D.L. 2002. African Rodents and the Bushmeat Trade. Silver- Spring, Maryland.

Taylor, R. 1978. Land use change and ringed- neck pheasants in Nebraska. Wildlife Society Bulletin. 6(4):230- 236.

Ter Braak, C,J.F. 1989. canonical Correspondence Analysis. A new Eigen vector techniques for multivariate data analysis. Ecologia 67: 11 70- 117.

Texas Parks and Wildlife Department 2002. Status of Plants and Wildlife Species in the US and Worldwide. Texas Environmental Profiles.

Thorsell, J.W. 1984. Managing protected areas in Eastern Africa. A training Manual.. USA National Park Service.

Udvardy, M.D.F. 1975. A classification of the Biogeographical provinces of the world. LU.C.N occasional paper No.18, Gland, SWitzerland, 45pp.

UNEP, United Nations Environment Programme (1994). Global biodiversity, assessment.. cambridge press.

VesseyrFitz. Gerald. 1960. GraZing Succession among East African game animals. J. mammals 41: 161- !72.

Von Ritcher, W. 1979. The utilization and management of wild animals. In Animal Research and Development.P.93-103. Thubingen, Germany. Institute for Scientific Cooperation.

Walker, E.P. 1978. Mammals of the world, Vol.II; The John Hopkins University Press. Baltimore.

Wangari, E. 1998. Statement on Biodiversity Conservation: Modern concept and Traditional knowledge: In proceedings of the third UNESCO MAB regional seminar on Biosphere reserves for Biodiversity by conservation and sustainable development in Anglophone Africa (BRAAF), Cape Coast.

Wilcox, B.A. 1984. Insular Ecology and Conservation. In: Soule, M.E. and Wilcox. B.A. Conservation Biology, Sinauer Assocoiates, Sunderland, Massacheusetts.