SUSTAINABLE CONSERVATION OF BIODIVERSITY IN RURAL ENVIRONMENT: STUDY OF SOME FAUNA AND FLORAL SPECIES IN SOME RURAL PARTS OF IMO STATE.

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ABSTRACT

This paper investigated the various advantages of sustainable conservation of biodiversity in rural parts of Imo state. This it does with the aim of investigating different species of biological diversity to identify species that have gone extinct, those threatened with extinction and various human activities that undermine the continuous existence of species. 320 copies of questionnaire were distributed in three local government areas of Imo state, each selected from three senatorial zones of the state. 318 copies were retrieved representing 99.4percent of the sample. Both primary and secondary data sources were used in the study. Data obtained were presented using frequency tables, percentages and statistical charts. Findings made by the study include among others that both faunal and floral species are on rapid decline in the study area as a result of excessive exploitation without commensurate replacement. Construction of structures and building in a cleared ecosystem are also a major factor of biodiversity loss. This paper thereby recommends among others, protected area systems, sustainable exploitation of wildlife and forest resources etc as measures that can curb the menace of biodiversity loss

Keywords: Rural, Biodiversity, Flora, Fauna

INTRODUCTION

Biological diversity or shortly biodiversity is the variety of life on earth. It includes according to definition by United Nations Convention of Biological Diversity (UNCED), the diversity of ecosystems, species, genes and ecological processes that brought them. One of the most worrisome effects of major environmental issues posing concern to human race is the decline and loss of plants and animals. This is in addition to ozone layer depletion and its concomitant global warming and climate change. Most of the biological diversity is found in developing countries; hence, there is rising awareness by concerned agencies like Overseas Development Agency (ODA), which has roles to play in helping these countries conserve and develop national parts for present and future generations. Being a country with diverse

landscape and rainfall regime, Nigeria has corresponding biological niches harbouring many species of plants and animals.

In global studies of diversity, Nigeria can be found near the top of the list, especially when it is considered as part of a region variously defined by different international NGOs as gulf of guinea first, the Cameroon highland ecosystem and the cross sanga faunal region of Cameroon-Nigeria trans-boundary. No matter what the area is called or exactly how it is defined on the map, it could be argued that biodiversity has intrinsic aesthetic and spiritual value to mankind and itself. This idea can be used as a counter weight to the nation that tropical forest and other ecological realms are only worthy of conservation because of services they provide (Kelvin and Spicer 2004).

Concern for conservation of natural resources in Nigeria predates the emergence of Nigeria as an independent nation and has carried through to the present day. Nigeria now has a number of agencies and various policy frameworks for biodiversity, forest and other biological resources at all levels of government. Nigeria participates in many international treaties and enacts relevant national, state and local policies and legislation.

STATEMENT OF THE RESEARCH PROBLEM

It is a common belief these days that the tropical rainforest is on decline. This decline can be attributed among other things to the excessive exploitation without replacement. The above scenario is not an exception in rural parts of Imo state, where excessive exploitation of forest endangers some plant species in the ecosystem as well as some animals whose natural habitat is forest cover. The type(s) of animals that are no longer found in the area do not seem to have accurately identified and listed.

Increase in population resulting to urbanisation can lead to land scarcity and depletion of biodiversity values. Problem of conservation of biodiversity can be caused by man's activities such as agriculture and construction. What eludes the study area is the identification of the degree to which man's activities of agriculture and construction has contributed to biodiversity loss in the area.

The diverse forest canopy yielded a display of different fruits. Biodiversity's relevance to human health is becoming an international political issue, as science stress global health implication of biodiversity loss. This is closely linked with an issue of climate change, as many of the anticipated health risk of climate change are associated with changes in biodiversity (e.g. changes in population and distribution of disease vectors, scarcity of freshwater, impact n agricultural biodiversity and food resources) (Sahney and Benton 2008). Some health issues influenced by biodiversity include dietary health and nutritional security, infectious disease, medical science and medical resources, social and psychological health. What the paper will try to investigate is whether biodiversity decline in the study area has affected the health of the people in one way or the other

AIM AND OBJECTIVES

The overall aim of this research is to bring to light the extent to which flora and fauna species in rural part of Imo state have been affected. The specific objectives of the study are

1. to ascertain if and the level at which some fauna and flora has gone extinct in the area
2. to access the factor driving/responsible for biodiversity loss in Imo state
3. to investigate the effect of biodiversity loss on the population
4. to identify some conservation methods put in place in the area to checkmate biodiversity loss

MATERIALS AND METHODS

Data for this study were collected from primary and secondary sources. Secondary data were collected from related published and unpublished materials. Primary data were obtained through personal oral interviews and questionnaire survey. Also in the advance of the study, a reconnaissance survey was carried out to obtain biodiversity information of the study area. 320 copies of questionnaire were distributed in three randomly selected local government areas of Imo state. The questionnaire probes among other things the occupation of respondents, different types of plants and animals life in the area, the number of plants and animals now and in the past two decades, the causes of decrease or increase in some species of biodiversity. Tables, charts and percentages were used to present and analyse data for the study

THE STUDY AREA

The study area is Imo state studying Okigwe, Ngor okpala and Isu local government areas. The study focussed on rural parts of these local government areas. The three local areas were randomly selected from each of the three senatorial zones of the state (Okigwe, Owerri and Orlu zones). Imo state lies between latitude 5^0 10'N – 6^0 00'N and longitude 6^0 40'E – 7^0 23'E of the Greenwich meridian. The spatial extent according to federal office of statistics (FOS) is 5,530 square kilometres. It is bound in the north by Anambra state, on the west by Delta state, on the south by rivers and on the east by Abia state. The 2006 population data of the area is seen in Table 1

TABLE 1: 2006 POPULATION DATA OF THE STUDY AREA

Area	Population Data		Total
	Males	females	
Imo	1,976,471	1,951,092	3,927,563

Okigwe	67,660	65,041	132,701
Ngor Okpala	78,829	79,029	157,858
Isu	84,229	80,029	164,328

Data Source: NPC, 2006

However, it was projected that the population of the area grows at about 2.8 % annually.

LITERATURE REVIEW

Biodiversity according to OTA 1987 is a shorter form of biological diversity. It is the variety and variability of living organisms and ecological complexes in which they occur. According to United Nations Conventions on Biological Diversity (UNCBD), biodiversity includes the diversity of ecosystems, species and genes and ecological processes that brought them. Biodiversity can be measured in terms of biomes (e.g. tropical moist forest or coastal wetland), ecosystems (a portion of biome in which the living organism seem to be self sustaining), species and genetic varieties (McNeely et.al 1990)

Biodiversity is not evenly distributed. Flora and fauna diversity depends on climate, soil, and presence of other species (Sahney etal, 2010). Diversity consistently measures higher in the tropics and in other localized region of the world such as Cape floristic province and lower polar region (Kevin et al. 2004). Biodiversity supports ecosystem services including air quality, climate (e.g. Co_2 sequestration), water purification, pollination, and prevention of erosion.

STATUS OF BIODIVERSITY IN NIGERIA

Biodiversity in Nigeria includes animals (mammals, birds, lower vertebrates and invertebrates) and plants.

For mammals, despite international concern about the status of many species of plants, animals and lower organisms in Nigeria, the actual data about what lives in the country is sketchy. Those organisms

closest to man (primates) have understandably received good attention and more is known about them than any other species. Primates found in Nigeria include Cross River Gorilla *(gorilla gorilla diehii*), Nigerian chimpanzee *(pan troglodytes vellerosus*), and the baboon sized drill (*mandrillus leucophaeus*). Other lower primates like three of these small monkeys – the white throated monkey *(cercopithecus erythrogaster*), sclater's guenon (*cercopithecus sclateri*), and the Niger Delta red colobus (*procolobus pennantii epieni)* are found in Nigeria.

Beyond primates, knowledge about other mammals seems scarce and spotty. Nigeria used to be home to large herds of elephants, lions, wild dogs, giraffes and other savanna mammals that roam widely around the country. Now giraffes and wild dogs are gone or nearly gone, and lions and elephants are only reliably seen in a few protected areas, where even there, their number is said to be decreasing (FEPA, 2003).

For birds, Nigeria is a hotspot of bird diversity. Birdlife international (www.birdlife.org) has declared twenty seven (27) important bird areas in Nigeria. Nigeria was said to be the seasonal breeding or year round home of 906 bird species (FEPA, 2003). Of these species, twelve are threatened and three- the *Anambra Waxbill (Estrildapoplipaus),* the *Ibadan Malimbe (malimbus Ibadanensis*), and the Jos indigo-bird (*Vidua, maryae*) are found in Nigeria (Aminu-Kano, 2001).

The status of biodiversity in Nigeria is seen in Table 2

Table 2: BIODIVERSITY IN NIGERIA

Species	**Total number in Nigeria**	**Number of species threatened**	**Number of species found in Nigeria only**
Plants	5,103*	171	?
Mammals	247*	29	3*

Birds	906*	12	3*
Reptiles	135*	3	1**
Amphibians	109*	13	5***
FW fish	247*	21	?
Invertebrates	More than 20,000*	1	?

Source: *FEPA, 2003; **IUCN, 2007; ***Aminu-Kano 2001

In her bid to conserve her biodiversity, Nigeria is signatory to some international treaties on biodiversity as is seen in Table 3

TABLE 3: INTERNATIONAL TREATIES ON BIODIVERSITY WHICH NIGERIA IS A SIGNATORY

TREATIES	**SIGNATURE**	**RATIFICATION**	**DEPOSITORY**
Convention concerning the protection of world natural and cultural heritage	16-11-1972	1974	UNESCO, Paris
Convention on international trade on endangered species (CITES)	11-2-74	09-05-74	Swiss Ministry of Foreign Affair, Berne
Convention on Conservation of Migratory Species of Wild Animals	1987	-	Foreign Offices of Fed. Rep of Germany
Convention on Law of the Sea	10-2-82	1986	
Convention on Biological Diversity	13-6-92	29-8-84	
United Nations Convention to Combat Desertification (UNCCD)	1995	08-04-97	
African Convention for Conservation	15-09-68	02-04-74	AU Addis Ababa

of Nature and Natural Resources			

Source: Extracted from BSP 1993

RESULTS AND DISCUSSIONS

LEVEL OF BIODIVERSITY EXTINCTION IN IMO STATE

In the most comprehensive assessment of its kind, 5,167 African fresh water species were evaluated by 200 scientists over a five year period for International Union for Conservation of Nature (IUCN) Red list of threatened species including fresh water fish, molluscas, crabs, dragon flies, and damselflies and selected families of aquatic plants (Campbell, 2003). Plants and animals in an environment whose habitat remains intact will improve in their need and develop for the satisfaction of human race. It is creating an enabling environment for these plants and animals that is termed conservation. Therefore finding out if the environment is being degraded is to find out if some of the species have declined or gone extinct.

To examine the situation in the study area, the respondents were asked to indicate the number of biodiversity species found in their area. Their responses are presented in Tables 4 and 5.

TABLE 3: RATE OF FAUNA DISAPEARANCE IN IMO STATE

Animal species	**scientific Name**	**Frequency**	**Percentage**
Antelope	*Hypotragus*	52	16.35
Patas monkey	*Erythrobus*	30	9.43
Hedgehog	*Albiventris*	68	21.28
Pouch rat	*Cricetomys Gambianus*	15	4.72
Python	*Python sabae*	58	18.24
Guinea foul		20	6.29
Porcupine	*Alfeam*	30	9.43
Tree Squirrel	*Epixerus ebii*	38	11.95
Tortoise	*Geochlena Giganta*	7	2.20
Total		**318**	**100.00**

Data Source: Author's fieldwork, 2011

From the data in table 4, hedgehog *(albiventris*) is the most endangered fauna in Imo state as indicated by 68 respondents or 21.38 percent of the respondents. This is followed by Python with 58(18.24percent) of the respondents. Next in the order is the *hypotragus* (antelope) which has 52 respondents or 16.35 percent. Other animal species and their various rates of disappearance are seen in the data in Table 4. It is not a surprising that these animals have become endangered because the forest that harbors them has been seriously degraded. This is because the fallow period now practiced is not long enough for the forests to regenerate. Therefore, for these animals to protect themselves, they now migrate to a better habitat. It was also learnt that the people of the area love the meat of these animals

and they use the horn and hooves of antelope for rituals, hence the excessive and uncontrolled exploitations of these animals. They also hunt them for food and in their hunting expeditions; the young ones are gunned down thereby hampering regeneration.

ENDANGERED PLANT SPECIES IN IMO STATE

Having identified the extent of extinction of faunal species, the research focus shifted to what happens in the floral kingdom in the study area. The rate and level of extinction of some flora is seen in Table 5.

TABLE 5: ENDANGERED FLORA IN IMO STATE

scientific Name	**Frequency**	**Percentage**
Milicia exclesa	65	20.4
Gossweilerodendron balsamiferum	94	24.7
Treculia Africana	35	11.0
Alstonia boonei	73	22.9
Newbouldia laevis	30	9.4
Baphia nitida	21	6.6
TOTAL	**318**	**100.0**

Source: Author's fieldwork, 2011

The information in Table 5 shows that 94 out of 318 respondents representing 24.7 percent indicate that *Gossweilerodendron balsamiferum* is the most endangered tree species in Imo state. This tree is a hard wood used for different construction purposes. The high demand for the tree leads to excessive exploitation thereby causing a high rate of extinction. Next to *Gossweilerodendron balsamiferum* is *Alstonia boonei* which is indicated by 73 respondents or 22.9 percent. Others are *Milicia exclesa* 20.4 percent of the respondents. Other plants found in the area that are becoming endangered and may in future become extinct if adequate conservation practices are not put in place are African breadfruit

(*Treculia Africana*) (11.0percent), *Newbouldia laevis* and (*Baphia nitida*) *camwood* which are represented by 9.4percent and 6.6percent of the respondents respectively. It is necessary to point out that while African breadfruit is a very nutritious food plant with high protein content, *Baphia nitida* and *Newbouldia laevis* are medicinal plants. Therefore the extinction of these species will greatly affect both the nutritional intake of the people of Imo state as well as the health condition of the people.

FACTORS INFLUENCING THE RATE OF EXTINCTION OF BIODIVERSITY IN IMO STATE

For any species to be endangered, some factors must be responsible for such situation. When the respondents were asked the factors responsible for the extinction of flora and fauna in Imo state, they indicated among other things: habitat destruction (deforestation), introduction of invasive species, over exploitation, climate change, urbanization etc.

The data in Table 6 represents the respondent's reaction on the factors responsible for extinction of biodiversity.

TABLE 6: ACTIVITIES CAUSING BIODIVERSITY LOSS IN IMO STATE

Activity	**Frequency**	**Percentage**
Habitat Destruction (Deforestation)	118	37.7
Invasive species introduction	28	8.81
Over Exploitation	92	28.93
Climate Change	46	14.47
Urbanisation	34	10.69
Total	**318**	**100.00**

Data Source: Authors Fieldwork, 2011

The data in Table 6 are represented in figure 1

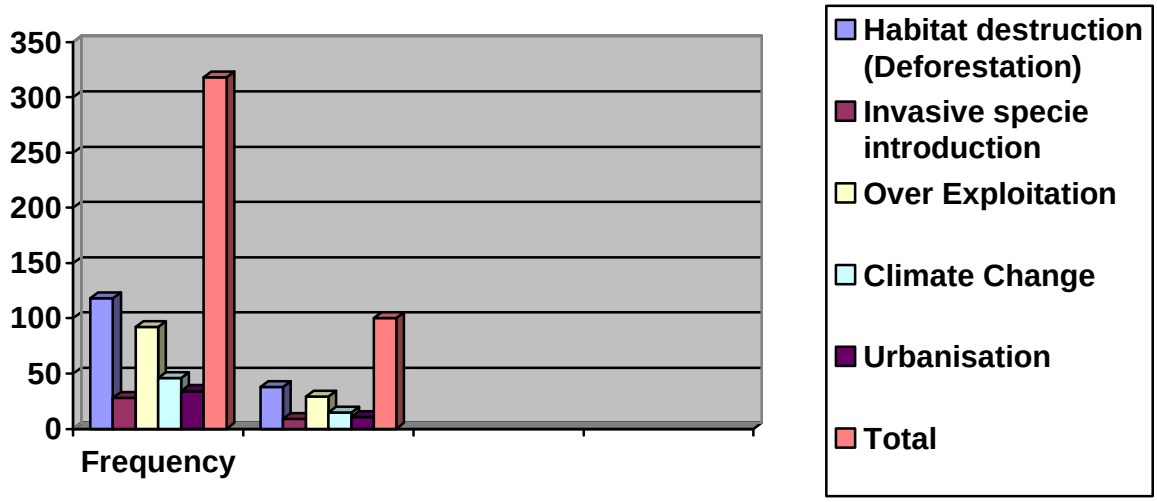

Figure 1: Activities causing biodiversity loss in Imo State

Source: Author's fieldwork, 2011

Habitat destruction and increase in the construction of buildings in Imo state are of significant concern because of increased human encroachment upon wild areas and increase in resource exploitation further threatens biodiversity. Deforestation is seen as the greatest activity that causes biodiversity loss in the study area as indicated by 118 respondents or some 37.7 percent of the respondents. Habitat destruction has played a key role in extinctions, especially related in tropical forest extinction. It is estimated that more than one-third of the earth's biomass is tied up in humans, livestock and crop species (Bamach et al, 2004).

In the study area, it was observed that introduction of invasive species is not a major activity that causes biodiversity extinction. Although invasive species evolves to fill many niches which without barriers, such species would occupy those niches on a global basis, substantially reducing biodiversity, yet this activity is not a major cause of biodiversity loss in the area as represented by 28 respondents representing 8.81percent. Another activity that causes biodiversity extinction in the study area is over

exploitation. This was the view of 92 respondents representing 28.98 percent of the sample size. This activity is a major problem because fauna and flora species are exploited in an unsustainable manner. This activity occurs on land in the form of over hunting, excessive logging, poor soil conservation in agriculture etc. Other activities that cause extinction of fauna and flora to some degree in the study area are climate change and urbanisation that are indicated by 46 respondents (14.49 percent) and 34 respondents (10.69percent) respectively.

CONSERVATION METHODS IN THE STUDY AREA TO MINIMIZE EXTINCTION OF BIODIVERSITY

Conservation is the management of human use on the biosphere to yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of the future generation. Conservation embraces preservation, maintenance, sustainable utilization and restoration, and enhancement of natural environment. To conserve her biodiversity species from extinction, Nigeria is a signatory to many international conventions that project the maintenance and existence of biodiversity. Despite these treaties to protect flora and fauna which Nigeria is a signatory to, the rural parts of Imo state have ensured the existence of their biodiversity, though their intention is not purely for conservation, through the following ways;

1. Respect for natural ripening/harvesting periods for certain crops; palm fruits; African breadfruit; local star apple (*dacryodes edulis*). This is to ensure that the seeds of these ripened fruits will be able to germinate when planted.
2. Prohibitions imposed on exploitation of some resources on the account of traditional religion. For example, fishing in some streams and lakes is forbidden. Examples of such streams are *Iyiocha, Nwogba and Duru in Ogii* autonomous community in Okigwe local government area.

Certain animals such as bush rat, the python and even some species of snail are not eaten by some members of some locality on account of traditional religious belief. While python is not eaten by *Aro*s in Imo state, white specie of snail are forbidden in *Ezinachi* and leopard is forbidden in *Ogii*. This practice ensures the existence of these species in these localities.

3. The designation of some forest as 'evil' result in the preservation of their resources. This type of forest is exemplified in some parts of *Ikpa ogu in Ezinachi* and *Ihu Ogwugwu* in *Ndi Njoku Aro Ogii*.
4. The prohibition of hunting during some periods of the year, which period allows the livestock to have the opportunity to multiply.
5. The prohibition of tree felling in areas designated as shrines.

CONCLUSION AND RECOMMENDATIONS

Nigeria's biodiversity and associated habitats are important locally and globally in many ways; beyond pure aesthetics, providing valuable environmental services, present and future economic benefits and quality of life values that are difficult to quantify. As climate change and global warming become more evident, the values that forest and wetland serve in modulating temperature and protecting against storm damage cannot be exaggerated. Biodiversity supports ecosystem services including air quality, climate, water purification, pollination and prevention of erosion. Although about 80% of human food supply comes from just 20 kinds of plants, yet humans use more than 40,000 species (UNEP, 1995). Many people depend on these species for food, shelter, and clothing. Biodiversity is also relevant to human health. It provides critical support for drug discovery and availability of medicinal resources. A significant proportion of drugs is derived directly or indirectly from biological resources. Finally, biodiversity enriches leisure activities such as hiking, bird watching or natural history study.

Biodiversity inspires musicians, painters, sculptors, writers and other artists. As a result of the above and other important values that biological resources provide, efforts should be made both locally, nationally and internationally to conserve them.

RECOMMENDATIONS

The following recommendations will help in a long way to conserve and maintain the flora and fauna in the study area particularly as well in different parts of the country generally.

1. **PROTECTED AREA SYSTEM**: More areas should be designated as protected areas by means of cultural and religious rules. Strict penalties should be placed on the harvest of certain species of plants and animals from the area. Farmland should be allowed to remain fallow up to five years, and local plant varieties should be nurtured.
2. **SUSTAINABLE EXPLOITATION OF WILDLIFE**: Efforts should be made to manage and accurately access the size of animal populations so that sustainable harvest limit (mostly outside of protected area) can be defined. Also governments should set harvest quotas and lease parcels of land for controlled wildlife exploitation to hunters.
3. **REFORM IN MODERN PRODUCTION SYSTEMS**: Traditional production systems like hunting and gathering, pastorialism, subsistence farming and fishing should be replaced with modern production systems like monoculture farming with hybrid seed, fertilizer and pesticides. This will complement the demand for higher levels production for growing populations.
4. **BIODIVERSITY MANAGEMENT IN LAND USE PLANNING**: At the national level, improved land use planning should be undertaken as an important step in biodiversity conservation process. Since people need to use natural resources, ways must be found to use

these resources in the least destructive manner. One method might be to surround protected area with concentric zones of increasing exploitation and therefore lessen biodiversity exploitation.

5. **COMBINATION OF TRADITIONL SYSTEM**: Here foreign conservation technologies must be adopted to African context to complement traditional technologies. This new combination of traditional and modern methods can be sensitive to biodiversity conservation while providing adequate levels of sustainable production (Biodiversity Support Programme, 2003).

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