

**THE IMPACT OF HUMAN ENCROACHMENT AND RIVER BANK
AGRICULTURAL ACTIVITIES ON THE HABITAT OF THE MANATEE
(*Trichechus senegalensis*) ALONG THE LOWER BENUE RIVER,
BENUE STATE, NIGERIA**

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ABSTRACT

The impact of human encroachment and river bank Agricultural activities on the habitat of the manatee (Trichechus Senegalensis) was investigated. The method of data collection involved the use of a structured questionnaire administered to farmers and fishermen. Vegetation survey in three selected sites along the river was carried out during the dry and raining seasons and crops cultivated during these seasons were identified. Chemicals used by farmers, measurement of settlements and farms from the river bank as well as the population trends in the selected zones were investigated. The result was subjected to descriptive and inferential statistics. Nine different vegetable crops were cultivated in Makurdi over an area of 16.974 ha, while 3 crops were cultivated in Abinsi (11.2076 ha) and 2 in Gbajimba (6.8775 ha). Plant diversity in Makurdi during the dry season is (0.1322), Abinsi (0.795) and Gbajimba (0.0568) while Abinsi had a diversity of 0.3281 Makurdi 0.2524 and Gbajimba 0.1749, during the raining season. Correlation coefficient (r) shows a significant relationship (p>0.05) between plants during the dry and rainy period in all the three zones. There is massive use of chemicals during the dry season farming while there is an increased activity of sharp sand collection along the river.

Key words: Encroachment, River Bank, Habitat and manatee.

INTRODUCTION

Human activities along the River Benue have increased significantly over the years. As such the West African manatee *Trichechus senegalensis*, which are still thriving in some parts of the river and its tributaries are been threatened (Happold, 1987). According to Bolen (2000), 30% of 4000 deaths of manatee in the Florida River in the United State of America were attributable to human activities. These activities ranged from human settlements along the river bank, fishing as well as river bank agricultural activities. The Florida Marine Research Institute (2000) reported that habitat destruction and alteration, decrease in water quality and increased debris was seriously

impacting on the Florida manatee in the U.S.A. Egwumah and Iwar (2006) had reported that human activities on the River Benue has caused substantial alteration to the Manatee habitat by affecting the tropic dynamics of the Rivers ecosystem. Obot (2003) reported on the survey on the status of the West African manatee carried out by Nigeria Conservation Foundation from 1998 to 2002. Most research on manatee in Nigeria had focused more on their status, their distribution and abundance and have all come to the conclusion that they are a threatened species. The present work focuses on agric activities along the river bank as the cause of manatee population decline. According to Barboult, and Sastrapradja

(1995) a species could be threatened with extinction by the following factors namely: loss of its natural habitat, change in the habitat quality, habitat fragmentation, persecution or exploitation of the population and change in the biotic environment. The aim of this study is to assess the impact of agricultural activities on the floral composition and the habitat of the manatee.

MATERIALS AND METHODS

Study area

The study site covers a distance of 45km along the River Benue from Makurdi to Gbajimba. This area lies within latitudes 07°49'N and longitudes 08° 36'N and 08° 40'E. The area has distinct dry and wet seasons. The dry season starts from November to March while the wet season begins from April and ends in October. Annual rainfall lies between 1,240mm and 1440mm, while the monthly temperature ranges from 28 °C to 36 °C and may rise to 38 °C in March and April. The area lies at about 100m above sea level and the River Benue is subjected to annual flooding between the months of June and September.

Data collection

Data was collected from three settlement

areas along the River Benue namely; Makurdi, Abinsi and Gbajimba, the headquarters of Guma Local Government. In each sample area during the dry season, structured questionnaire was administered to the fishermen, farmers and settlers on their use of the river resources; settlement area, types of crops cultivated and their farm sizes measured. At every area five plots of 30m x 30m were randomly laid on both banks of the river and the floral composition identified and enumerated. The distances of farms from the river bank as well as settlements were also measured. Random sampling and identification of the floral composition was again repeated during the rainy season (June to September). Population figure were obtained from the National Population Commission (NPC) Makurdi Office to give us a population trend in the sampled areas within the past ten (10) years.

DATA ANALYSIS

Data was subjected to both descriptive and inferential statistics; percentages, chi-square test, correlation co-efficient and Shannon-Weiner diversity indices.

RESULTS

Table 1: Plant species composition and their percentage in the sampled areas along the River Benue during the dry season

Plant Species	Makurdi	Abinsi	Gbajimba
<i>Aithernathera sesils</i>	1.63	-	-
<i>Amaranthus spinosus</i>	3.40	-	-
<i>Andropogon gerradii</i>	-	0.54	-
<i>Azolla pinnata</i>	0.18	-	-
<i>Calopogonium mucunoides</i>	-	-	0.02
<i>Cardiospermum halicacabum</i>	4.24	4.06	0.29
<i>Celosia Leptostachya</i>	0.62	-	-

<i>Cissus ibuensis</i>	-	1.08	0.23
<i>Cirsium vulgare</i>	-	-	0.09
<i>Cleome spinosa</i>	0.65	-	-
<i>Comarlina cummunis</i>	2.57	-	-
<i>Croton lobatus</i>	1.16	0.30	-
<i>Cynodon dactylon</i>	7.71	27.08	21.41
<i>Cyperus esculentus</i>	0.87	-	5.63
<i>Cyperus imbricatus</i>	2.17	0.54	-
<i>Digitaria horizontalis</i>	2.21	0.54	1.46
<i>Echinoelia colona</i>	5.07	-	-
<i>Echornia crassipes</i>	2.86	-	-
<i>Elusine indica</i>	1.45	-	-
<i>Euphorbia heterophylla</i>	0.71	-	-
<i>Ficus asperifolia</i>	-	2.71	-
<i>Heliotropium indicum</i>	12.32	1.92	0.11
<i>Ipomea aquatica</i>	3.73	0.41	0.45
<i>Luffa cylindrica</i>	1.96	0.11	0.95
<i>Mimosa pigra</i>	7.02	22.20	0.68
<i>Moiscus altronifolia</i>	1.12	-	1.35
<i>Ocimum basilicum</i>	-	1.90	-
<i>Paspalum conjugatum</i>	-	0.27	0.23
<i>Paullinia pinnata</i>	1.16	-	-
<i>Phyllanthus amarus</i>	0.76	-	-
<i>Polygonium acuminatum</i>	5.03	0.27	-
<i>Pterocarpus santalinoides</i>	3.33	0.05	-
<i>Quisqualis indica</i>	1.38	1.30	-
<i>Ricinus communis</i>	-	1.08	3.00
<i>Rottboelia cochinchinensis</i>	-	1.08	-
<i>Sesbania bisponosa</i>	-	0.41	-
<i>Sida acuta</i>	-	0.19	-
<i>Sorghum arundinaceum</i>	10.68	2.44	34.48
<i>Stachytepheta indica</i>	2.28	-	5.18
<i>Torenia founneiri</i>	-	-	0.90
<i>Tribulus terrestria</i>	-	29.79	0.09
<i>Urena lobata</i>	-	-	0.23
<i>Vitiveria flavibarbis</i>	4.60	-	1.35
<i>Vossia cuspidata</i>	4.38	0.81	20.40
	100%	100%	100%

Table 2: Plant species composition and their percentage abundance in the three sampled areas along the River Benue during the Rainy season.

Plant Species	Makurdi	Abinsi	Gbajimba
<i>Ageratum conyzoides</i>	4.67	4.10	2.76
<i>Amaranthus hybridus</i>	1.32	-	-
<i>Amaranthus spinosus</i>	2.54	3.34	3.22
<i>Althernathera sesils</i>	1.22	-	-
<i>Azolla pinnata</i>	2.03	-	-
<i>Bracharia brizantha</i>	-	1.22	-
<i>Colopogonium muconoides</i>	1.72	2.89	-
<i>Cardiospermum halicacabum</i>	-	-	6.37
<i>Cassia occidentalis</i>	3.35	4.86	3.00
<i>Celosia leptostachya</i>	3.75	3.80	2.72
<i>Cissus ibuensis</i>	0.30	-	-
<i>Commelina cummunis</i>	4.36	1.62	-
<i>Corchorus aestuans</i>	4.36	1.52	1.86
<i>Ceruana pratensis</i>	-	-	-
<i>Cynodon dactylon</i>	2.33	8.97	-
<i>Cyperus esculentus</i>	4.36	-	-
<i>Dactycterium pyareus</i>	2.13	-	-
<i>Digitaria horizontalis</i>	3.65	3.65	9.30
<i>Echinoclia colona</i>	3.96	-	-
<i>Echornia crassipes</i>	8.72	7.60	4.08
<i>Elusine indica</i>	3.65	2.28	4.29
<i>Ethulia conyzoides</i>	1.93	3.34	-
<i>Euphorbia heterophylla</i>	5.37	-	-
<i>Ficus asperifolia</i>	-	-	2.07
<i>Heliotropium indicum</i>	1.93	-	-
<i>Ipomea aquatica</i>	2.84	-	3.65
<i>Ipomea heterotricha</i>	-	-	2.15
<i>Kyllinga brevifolia</i>	2.74	-	-
<i>Luffa cylindrica</i>	2.13	1.52	2.86
<i>Mimosa pigra</i>	2.84	8.36	-
<i>Ocimum basiliam</i>	0.51	2.74	-
<i>Cassia acutifolia</i>	0.91	-	-
<i>Oldenlaridia capensis</i>	2.54	-	-
<i>Paspalum conjugatum</i>	2.84	3.50	4.94
<i>Paullinia pinnata</i>	-	-	2.15
<i>Pentatropis spiralis</i>	-	-	1.50
<i>Physalis angulata</i>	3.25	1.98	-

<i>Pistia stratiotes</i>	2.13	5.78	4.94
<i>Polygonum acuminatum</i>	3.04	2.43	-
<i>Pterocarpus santalinoides</i>	-	-	0.57
<i>Pycreus flavescens</i>	-	-	2.07
<i>Quisqualis indica</i>	-	-	3.22
<i>Rottboellia cochinchinensis</i>	3.04	-	-
<i>Sesbania bispinosa</i>	-	1.22	-
<i>Sida acuta</i>	1.12	7.90	-
<i>Sorghum arundinaceum</i>	4.36	5.17	5.72
<i>Stachytapheta indica</i>	-	1.22	3.29
<i>Tridax procumbense</i>	-	1.37	4.94
<i>Urena lobata</i>	2.13	-	-
<i>Vitiveria flavibarbis</i>	-	7.60	3.58
<i>Ludwigia octovalis</i>	-	-	2.79
<i>Vossia cuspidata</i>	-	-	9.87
Total	100%	100%	100%

Table 3: The plant species diversity indices along the River Benue.

Area	Dry season	wet season
Makurdi	0.1322	0.2524
Abinsi	0.0795	0.3281
Gbajimba	0.0568	0.1749

Table 4: The correlation co-efficient and critical values at 0.05% level of significance between the dry season and wet season plants identified along the River Benue.

	Degrees of freedom	r-calculated	r-tabulated
Makurdi	45	0.489	0.288
Abinsi	35	0.727	0.325
Gbajimba	40	0.606	0.304

Table 5: The various crops cultivated along the River Benue during the dry season and the hectarage

Common name/scientific name	Makurdi	Abinsi	Gbajimba
Spinach (<i>Amaranthus hybridus</i>)	2.9317	-	-
Oyster nut (<i>Telfaria occidentalis</i>)	5.8792	-	-
Cassava (<i>Manihot esculenta</i>)	0.2275	-	-
Maize (<i>Zea mays</i>)	0.5300	6.537	40.5350
Pepper (<i>Piper nigrum</i>)	2.0875	1.0361	-
Sugar cane (<i>Sacharum officinarum</i>)	1.7200	-	-

Okro (<i>Abelmoschus esculentum</i>)	0.4200	3.6341	6.3425
Garden egg (<i>Solanum esculentum</i>)	2.7825	-	-
Onions (<i>Allium cepa</i>)	0.4000	-	-
	16.9764ha	11.2076ha	6.8775ha

Table 3: Gender of the respondents in the three sites (%).

Respondent		Makurdi	Abinsi	Gbajimba
Gender	Male	76	66	76
	Female	24	34	24

Table 4: Age distribution of respondents in the three sample sites (%).

Age Group	Makurdi	Abinsi	Gbajimba
20-50	34	12	32
31-40	30	34	38
41-50	34	42	18
51-60	2	12	10
61-70	0	0	2

Table 5: Level of Literacy of respondents in the three sample sites (%).

Education	Makurdi	Abinsi	Gbajimba
Literate	80	54	44
Non literate	20	46	56

Table 6: Occupational status of respondents in the three sample sites (%).

Occupation	Makurdi	Abinsi	Gbajimba
Fishing	24	36	34.88
Farming	34	26	39.53
Civil Servant	14	6	2.33
Fishing and farming	0	0	9.30
Trading	28	32	13.95

A X^2 test of independence indicates a significant difference ($P < 0.05$) in level of education of respondents, occupational distribution of respondents and respondents knowledge of manatee conservation status.

In Makurdi 60% of respondents use

herbicides while 40% use insecticides/pesticides, in Abinsi 33.33% use herbicides and 66.67% use insecticide and in Gbajimba, 45.45% use herbicides while 54.54% use insecticides.

Table 9: Herbicides and insecticides commonly used in all the three sampled sites.

Herbicides	Insecticides
Vinash (Glyphosate) 1litre	Cypetex IOEC (cypermithin/280ml
Ravage (Glyphosate) 1 litre	Kavate (lambda cyhalothin) 250m
Premum (Glyphosate) 1 litre	Thionex (endosulfan) 1 litre
Transmit (Glyphosate) 1 litre	Endocel (endosulfan) 1 litre
	Termicol (chloropyriphos) 1 litre

Table 10: Distances of residential area from the river banks during the raining and dry seasons in the three sample sites.

Seasons	Makurdi	Abinsi	Gbajimba
Rainy season	10m	60m	30m
Dry season	91m	100m	50m

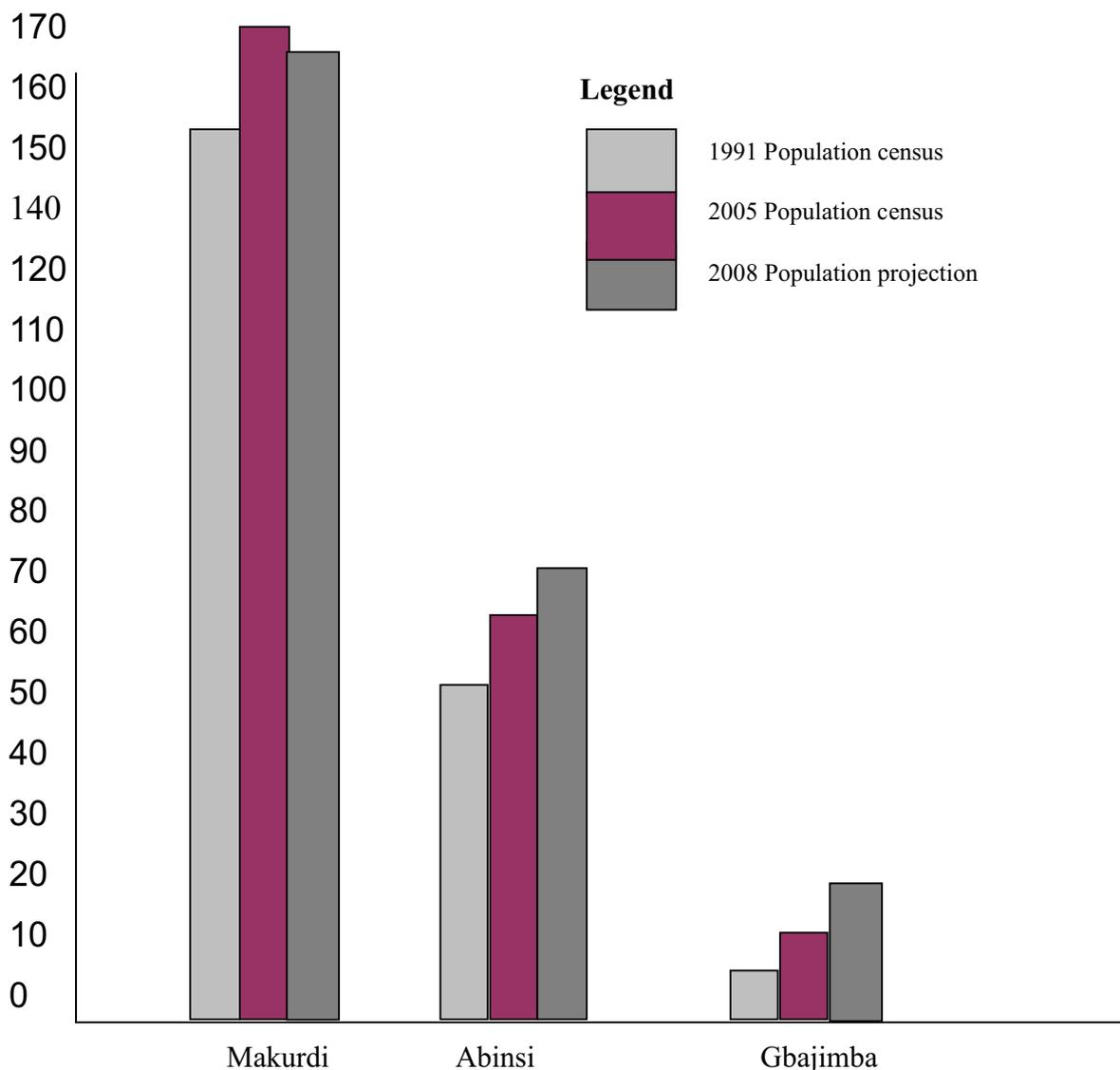


Fig 1: Population trend in the three zones along River Benue

DISCUSSION

The study investigated the impact of human encroachment on the habitat of manatee along the lower Benue River. The result indicate a significant difference ($P < 0.05$) in the age distribution from town to town while the males dominate in the proportion of those involved in farming and fishing along the river. There was significant difference ($P < 0.05$) in the respondents levels of education and conservation status of manatees. It was clear that those with informal education dominate the percentage of respondents. These persons have no idea of conservation and deserve special attention on the concept of conservation. Nine (9) different crops are cultivated in the study sites (Tables 5). All these nine species are cultivated in Makurdi covering a total of 16.976 hectares while in Abinsi three species; maize (*zea mays*), pepper (*piper nigrum*) and okro (*Abelmoschus esculentum*) only were found occupying a total of 11.2016 hectares and Gbajimba had only two species; Maize (*zea mays*) and Okro (*Abelmosch is esculentum*) covering a total of 6.8775 hectares.

Makurdi zone therefore has a greater number of hectage under dry season cultivation and this could account for the less mean total number of plants identified in the zone as compared to Abinsi and Gbajimba. Plant species diversity indices in the dry season (Table 3) reveal that Makurdi has about twice the diversity (0.1322) as compared to Abinsi (0.0795) and Gbajimba (0.0568). Abinsi and Gbajimba are characterised by a dominance of a few species, while the higher diversity Makurdi is attributable to changes due to efficient market gardening activities, maintained by irrigation practices. During the wet season, Makurdi (0.2524) has twice the

diversity of plants as compared to Gbajimba (0.1749) but Abinsi has a higher plant diversity of 0.3281. The plant correlation coefficient between the dry and rainy season (Table 4) indicated significant relationship of plant species ($P > 0.05$). This is due to successional change due to seasonality. As the rains come, some plant species identified encountered during the dry season along the river bank become submerged completely. The cumulative effect of herbicides and insecticides used by farmers will definitely have a negative impact not only on the soil and water but ultimately enter into the food chain thereby threatening the manatee which feeds exclusively on grasses. Happold (1987), Best (1981) and O' Shea *et al* (1984), reported their findings of mercury and copper in the tissues of manatee as a result of pollution from organo-chlorides in the manatee habitat. Similarly, Anthony *et al* (1999) had reported that extermination of any part of the biotic community would destabilize the ecosystem and alter the gene pool. The farming activities which has cleared large portions of the river bank of its natural vegetation has accentuated siltation of the river. This has generated another trade; the collection of sharp sand for the building and construction industry. This activity is especially noticed in Makurdi area. This result agrees with the findings of Bolen (2000) and Nicole (1994) who identified the loss of manatee habitat and changes in their behaviour pattern as a result of encroachments due to human activities along their preferred habitats. As population increase (fig1) and man's demand for sustainable livelihood forces him to utilize the River Benue for various reasons, it is clear that an uncontrolled exploitation is deleterious not only to the river and its resources but to man himself.

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