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CROSS RIVER ESTUARY: CHANGING TRENDS AND RESOURCE UTILIZATION PATTERNS

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ABSTRACT

The Nigerian mangrove area of 10, 500 sq km, forming 5.8% of the world's total mangrove, is the largest mangrove in Africa. Within this stretch of mangrove, 950km^2 belongs to Cross-River and constitutes the Cross-River Estuary. While studies so far on the Cross-River Estuary have focused on classifying these mangrove formations into vegetation categories and conducting a socio-economic characterization of fishing settlements and infrastructure, this study assessed the resource utilization patterns and examined trends in the quality and quantity of harvested resources and their associated management regimes. The study adopted Participatory Research Methodologies anchored on a suite of techniques such as Semi-Structured Interviews (SSI), Seasonality Analysis and Time lines to determine respectively the profile of harvestable resources, the change in quality and quantity of resources harvested, and the extent of the depletion of resource stock. This was focused on the Estuarine Resource User Groups in six selected settlements. The study observed significant changes over time in the quality and quantity of harvestable resources principally utilized for food, fuel and timber; a progressive lowering of income and the reduction of livelihood opportunities. Appropriate management responses for dealing with the declining resource availability are suggested.

KEYWORDS: Cross River Estuary, Changing Trends, Resource Utilization Patterns, Landuse/Landcover Change

INTRODUCTION

A growing concern of scientists in recent times is the need to understand the consequences of human interactions with wetland regions. This need is obvious particularly when regarded from the viewpoint of increased influences exerted from human consumption and developments. Wetlands may be regarded as areas or ecosystems whose land surface are saturated or covered with water for all or parts of the year (Cunningham and Cunningham 2002).

Wetlands are categorized into two, namely, freshwater and coastal wetlands. Freshwater wetlands or inland wetlands are lands that are transitional between aquatic and terrestrial ecosystems. Examples include marshes (grass-like plants), hardwood bottomland forests (shallow ponds which result when glacial ice melt), peat, moss logs found in peat accumulating and mosses dominated wetlands (Ravea, et al 1993).

Coastal wetlands often referred to as salt wetlands include estuaries and swamps. Estuaries are partially enclosed coastal areas at the mouth of a river where fresh water carrying fertile silt and run-off from the land mixes with salty seawater (Miller 1993). Swamps in coastal areas particularly within the tropical climates are of the salt-water regime. Such areas are dominated by varied species of mangrove trees, and shrubs, which have enabled the highest net primary productivity per unit area of any terrestrial or aquatic ecosystem.

Wetland regions abound in Nigeria. Though relatively unaltered, these regions have continuously enabled the sustenance of the populace especially along the coastal areas. The Nigerian mangrove area of 10,50sq km forming 5.8% of the worlds total mangrove area is the largest mangrove in Africa (Holzlohner, and Nwosu, 2000). Hence Nigeria ranks fourth among eight countries with very large mangrove resources. In view of the population concentration in Nigeria and the increasing demands exerted on the coastal wetlands, it becomes imperative for studies to be carried out that will address pertinent issues affecting wetlands and their ecological integrity. This study will therefore be an assessment of the changing trends and patterns of resource utilization within the Cross River Estuary. It is believed that the findings of this work will be relevant to planners in the formulation of policies that will ensure the continued availability and preservation of the coastal wetland resources in the Cross River Estuary.

The Cross River Estuary is an aquatic ecosystem, which harbours diverse life forms of fishes, plants and wildlife. It is also a useful medium for the sustenance of human livelihood and economic enhancement. The Cross River estuary has over the years been highly impacted by man in several ways. This is due to the high rate of population growth and rapid urbanization. Specifically, the Anantigha and Nsidung clans inhabiting the estuary region of mangrove and seasonal flood plains have amply utilized the natural resources within the environment for sustenance. The mangrove trees no doubt have been exploited for fuel wood and construction, the land for subsistence farming, the water for fishing while the forest is used for hunting.

The changes that have taken place in landuse and the resulting status of resources in recent times have become a cause for concern to environmentalists. The increase in population is exerting a high pressure on land. This is due to the high demand for residential and commercial buildings, and other infrastructures. This has led to land reclamation, establishment of fish ponds and other agro-allied businesses in the area. The creation of Calabar South Local Government Area is another factor that has contributed to change in land use patterns around the wetland which was essentially a fishing settlement and landing port for sea foods and other extracts from the estuary. Presently, the landuse within the estuary is directed towards the development of residential, commercial and administrative facilities as well as agricultural activities in the vicinity surrounding the wetlands.

The degree to which the change in estuary land cover has occurred is unknown. No study has addressed and

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documented the resource use patterns of the Cross River Estuary, its rich biodiversity and change in the level of resource stock. This portends a serious implication for wetland planning and management, as sustainable management programmes may be necessary in places where excessive resources exploitation have occurred. To this end the study seeks to answer the following questions:

- What resources are extracted from the estuary?
- What is the quantity and volume of resources extracted?
- What are the social and economic benefits of these resources to the people?
- What changes have taken place over time in the quality and quantity/ volume of resources extracted?
- What are the local management regimes for the resources of the estuary?

The aim of this study is to evaluate the changing trends in land resource utilization patterns in the Cross River estuary. The following specific objectives are outlined:

1. To profile and document the resources extracted from the estuary.
2. To examine the pattern of resource utilization and extraction in the Cross River estuary.
3. To examine the changes in landcover and volume of resources harvested.
4. To assess the effect of such changes on the livelihood sustainability of the local inhabitants around the estuarine region.
5. To assess the existing management regimes of the estuary resources.

STUDY AREA

The study area for this research is the Cross River estuary (figure 1). The area lies between latitude $04^0 41^1$E to $4^0 57^1$E and longitude 08^0 15^1N. Settlements found here include Nkanwaha, Okobo, Akpan Afang, Udo Okobo, Akasa and Akpa Afang all in Calabar South Local Government Area. Others are Inua Esighi, Asiakobufa, Edung, Utanidim, Iso, Iso Ikot Ania, Oron, Nnung Ikono, Etok Akpa and Anwanga, all located in Akpabuyo Local Government Area of Cross River State.

The area is mainly characterized by double maxima rainfall, which starts from April to October, reaching its climax in June and September. The annual rainfall is about 4000mm (NAA weather report 1995) with little dry season in August. From April to October over 80% of the total annual rainfall is experienced in this area.

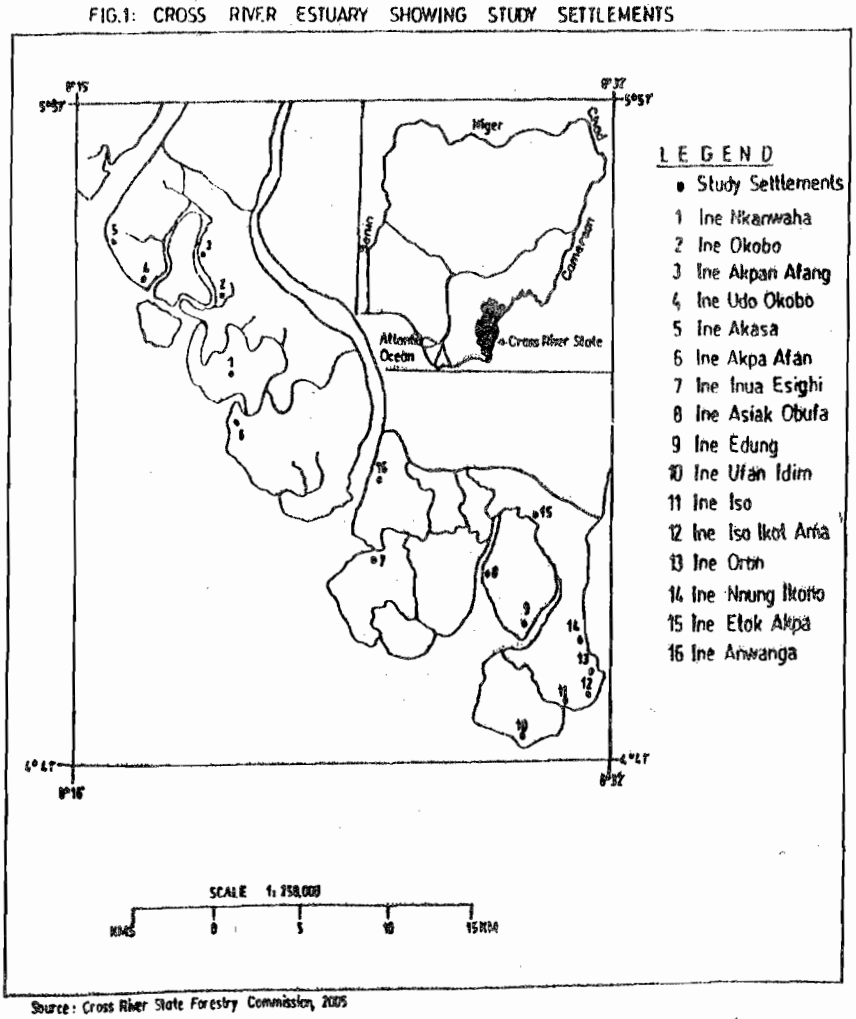
Temperature rarely falls below 19^0C and averages 27^0C all year round. Evapo-transpiration is expectedly very high in the region. This is as a result of the fact that the average daily maximum is above 24^0C with a range of 6^0C and a seasonal variation of the same extent between the hottest month (March) and the coolest month (August).

The estuary has a high relative humidity, usually between 80% and 100% and air pressure averages 29 millibars throughout the year (CRBDA Report, 1995). The particular kind of rainfall predominant in the area is the convectional rainfall type and the tropical maritime air mass while the climate is that of tropical rain forest.

The water found in this region includes both freshwater streams and brackish salty water both at the upper and lower stretch of the estuary. This harbours some reasonable aquatic organisms with some fish species like silver catfish, tilapia, croaker, *obon*, mudfish and mudskipper *nkip* and bonga fish etc.

The study area is typical of mangrove swamp, which is dominated by nypa palms, red mangrove trees, palm trees epiphytes, climbing plants (Lianas) and other herbs.

FIG.1: CROSS RIVER ESTUARY SHOWING STUDY SETTLEMENTS



Source: Cross River State Forestry Commission, 2005

CHANGING PATTERN OF ESTUARINE RESOURCE USE

Wetland regions have been recently observed to be threatened by increased human population concentrations. The resultant developmental efforts embarked upon by humans to increase their standard of living are in sharp contrast with the ecological integrity of wetlands and as such the resulting consequences have been a decline in area size. resource stock and quality of wetlands. The global picture of factors responsible for the degradation of wetlands arise from human induced perturbations that result from population pressure on resources, infrastructural developments as dam construction and reservoir development, power plants for hydro generation, dredging, oil spills, waste deposition from point and non-point sources, land clearing, soil erosion, and acidification. These have resulted in various forms of modifications in wetland environments.

Studies conducted in the Chesapeake Bay, which harbours the largest and most productive estuary in the production of oysters, and crabs, in the US, reveal that the Bay serves as a point and non point source for waste deposition. Consequently, an increased level of phosphate and plant nutrient, which enable algal blooms and oxygen depletion, result in drastic reduction in the commercial harvest of oysters, crabs and commercially important fish occurred (Miller, 1993).

Muggetti, et al (2004) revealed aquatic habitat modifications in the La Plata River Basin, Patagonia southeastern South America as a result of population growth, and show that the region which provided habitat to over 130 million people had witnessed heavy dependence on the limited surface and ground water resources of associated ecosystems. Significant losses and transformation of vial and riparian ecosystems, which emanated from dam constructions and reservoir development in the main watercourse for hydroelectric power generation and urban area development. Native resources species of the La Plata Basin were replaced with exotic species. Habitat degradation ensued from over fishing and increased pollution deposition into surrounding wetlands.

Badenet, et al (2003) documents on the vanishing sea grasses in the Swedish coastal waters largely caused by anthropogenic factors such are dredging, oil spills and waste dumping. Acidification was also observed to induce species shifts in coastal fisheries off the River Kyronjoki, Finland, and witnessed a significant loss of fish productions as reflected in market statistics and catch estimates.

The African wetland environments are not left out of the pressures exerted by population concentrations along coastal fringes. Sanusi et al (1998), in studying the coral reef mangrove regions of the Bagamoyo coast of Tanzania discovered that the region which had over the years constituted excellent grounds for fish and other marine organism habitation, building materials, traditional medicines and solar salt product was adversely affected by population encroachment into the region. Population explosion triggered off habitat destruction of marine organisms and over exploitation of resources. Various factors were identified which are responsible for the wetland misuse and they include lack of awareness of the linkages between coastal resources, poverty, resources competition and over-use, poor institutional arrangements within the region, policy failures and poor infrastructure.

Further studies by Franklin, et al (1998) along the Zanzibar region of Tanzania firmly buttressed the impacts exerted on the harvesting of reef building corals on coral reefs as induced by the growing human populations along the tropical coasts. Experiments conducted on coral culturing and temporal patterns in the recruitment of corals were disturbed by over excessive coral mining and destructive fishing.

Assessments by Awadzi and Asiedu (2000) of the Ghanaian Offin River Basin showed that the dredge mining of land for gold and timber have resulted in the loss of such top soil in all areas dredged resulting in soil fertility loss. The Mukwe Lagoon and adjoining wetlands in the Great Accra region of Ghana also witnessed degradation and the pollution of the lagoon and wetland, which threatened the health of the community and the ecological integrity and eco-tourism potential of the area.

The Cross River Estuary covering an area of 950km^2 is the largest along the coast of the Gulf of Guinea. Much of this is in its natural state and regarded as the most untouched in comparison with other mangrove systems despite its present level of human influence (Holzlohner & Nwosu, 2000).

Studies so far carried out on the Cross River Estuary have focused on the survey and mapping of its vegetation resources to clarify mangrove formations, and the identification. Mapping and socio-economic profiling of its fishing settlements. With respect to the former, Holzlohner, Nwosu and Akpan (2002) identified ten different vegetation categories in the Cross River Estuary and distinguished between its mangrove rich and mangrove poor parts. The significance of this was the delineation of areas for restoration measures. The study in addition adduced a positive correlation between the size and age of estuary villages and the occurrence of Nypa Palm (Nypa fruticans), which indicated relationship between declining mangrove stock and human utilization.

Enin, et al (1992) provided a frame survey of the fishing settlements in the Cross River Estuary with focus on the demographic attribute and socio-economic characteristics of the settlements to provide basis for fish stock assessment.

While the relevance of the above studies to the sustainable utilization and management of Estuary resource is not in doubt, much is still required in understanding the pattern of resource utilization in the estuary and trends through time in the quality and quantity of resources extracted as well as their socio-economic value to the resource users. This will be important in developing a sustainable management strategy for the estuary.

METHOD OF STUDY

The Participatory Research method was used in collecting data on the changes in landcover, specific biodiversity resources/products, collectors, volume and unit cost of resources collected. Seasonal calendars/time-lines were used to obtain the periods of extraction of certain species of fishes and other resources found around the estuary. In specific terms, Semi-Structured Interviews (SSI), resource mapping, and Time line were the major tools used in the collection of primary data.

The sampling techniques adopted consist of both the stratified and purposive sampling. This involved the selection of various estuary settlements, and identifying Resource User Groups for focus group discussion such as the fishermen and women, loggers of firewood, and gatherers on forest fruits and non-timber products. Elders and the chief council were also sampled and interviewed on the rules, regulations and management regimes within the estuary.

The settlements studied were selected to reflect the two major divisions of the Cross River Estuary, namely the Akpabuyo and the Calabar axis. Three settlements were thus selected from both axis. The settlements and their projected population in 1996 are provided in Table 1 below

Table 1: Settlements Sampled from the Cross River Estuary

S/n	Settlements	Population in 1996
A.	Calabar South	
1.	Ine Akpan Afang*	58
2.	Ine Okobo	233
3.	Ine Nkanwanga	89
B.	Akpabuyo	
1.	Ine Ikang	
2.	Ine Inua Esighi*	344
3.	Ine Asiak Obufa	
	Total	724

* Focal Point Settlements for Commerce and Trade

The settlements were purposively selected on the basis of their representatives in the resource extraction industry being the focal points for the fishing settlements in terms of commerce and trade. Accessibility considerations were also used in the selection of some of the settlements

Data obtained from the field were analyzed using tables, charts, graphs, frequencies and averages

RESULTS AND DISCUSSION

Estuary Resource Profile

The first objective of this study is to profile and document the resources extracted from the estuary. From Table 2, it is observed that several resources are extracted from the estuary ranging from floral, faunal, physical and aquatic resources. The resources though varied and many have been categorized based on their levels of importance.

The Red mangrove (*Rhizophora racemosa*) is for instance the most important of the floral species extracted by the locals, followed by Raphia Palms (*Raphia hookeri*), and then the timber species Table 2. The Bush Pig (*Potamochcerus porcus*) and Antelope (*Tragelphus euryceros*) ranks high among the faunal species, while fish, Cray fish and periwinkles are the most important aquatic products extracted by the local people from the estuary. The use value of the various products harvested is as shown in Table 2.

Table 2: Common Resources Extracted from the Estuary

S/n	ESTURARY RESOURCES		USE VAUE	IMPORTANCE RANKING
	RESOURCES/ TYPE NAME	BIOLOGICAL NAME		
A	**FLORA**			
1	Raphia palms	Raphia hookerii	Construction/ income/ drink	2nd
2	Red Mangrove	Rhizophora racemosa	Fuel wood/ income	1st
3	Achi	Brachystegia sp	Income/ construction	5th
4	Opepe	Nauclea diderrichii	Income/ construction	5th
5	Owen	Mitragyna sp	Construction/ Income	3rd
6	Silk cotton	Ceiba pentandra	Income	9th
7	Mahogany	Entandrophragma cylindricum	Income	5th
8	Sterculia	Sterculia rhinopetala	Medicine/ Income	4th
9	Ntufiak	Ozystigma manii	Income	-
10	Ibesin	-	Medicine	10th
11	Mkpaka	-	Medicine	-
B	**FAUNA**			
12	Bush Pig	Potamochoerus porcus	Food/ Income	1st
13	Antelope	Tragelaphus euryceros	Food/ Income	2nd
14	Crocodile	Crocodilus spp	Food/ craft/ Income	4th
15	Tortoise	Kinixyx belliana	Food/ Craft/ Music	3rd
16	Akang			5th
C	**AQUATIC**			
17	Fish		Income/ Food	1st
18	Periwinkle	Gastropod molluscs	Income/ Food/ Construction	3rd
19	Sea turtle		Food/ Music/ Craft	7th
20	Prawns		Income/ Food	4th
21	Cray fish		Income/ Food	2nd
22	Crab	Cancridae	Food	6th
23	Oyster	Bivalve molluscs	Food/ Income	5th
D	**PHYSICAL RESOURCES**			
24	Clay		Homemaking/ construction	1st
23	Sand		Homemaking/ construction	2nd
26	Water		Drinking/ washing/ cooking	3rd

Source: *Authors' Field Survey, 2005*

ECONOMIC VALUE AND QUANTITY OF RESOURCES EXTRACTED FROM THE ESTUARY

Tables 3 & 4 highlights the economic value and quantity of the most important resources extracted from the estuary for an individual collector. This is computed from analysis of indicators such as unit of collection, seasonality, frequency, and the unit cost of the resources. The estimate is made for the gross value of the resource rather than the net which may be discounted when the cost input is taken in consideration.

Table 3: Economic Value of some Important Estuary Resources Harvested in 2005

S/n	Resource	Unit of collection/ sale	Season of collection	Frequency of collection	Quantity collected per trip	Total per season	Cost per unit	Total value per season (₦)	Ran-king
1	Fish	Basins/ Baskets	WET April – Oct	Daily (5 days per week)	7	980 baskets	₦300	₦294, 000	1st
2	Cray Fish	Bags	WET May – Oct DRY Nov – April	Daily (5 days/ week)	3	720 bags	₦300	₦216, 000	2nd
3	Periwinkle	Bags	DRY Nov – March WET April – Oct	Weekly	5	240 bags	₦500	₦120, 000	4th
4	Prawns	Bags	DRY Nov – Feb WET March – June	Daily (5 days/ week)	2	320 bags	₦300	₦96, 000	5th
5	Timber	Logs	DRY Nov – March WET April – May	Weekly	7	160 logs	₦200	₦36, 600	6th
6	Raphia Palm (Palm fonts)	Bundles	DRY Nov – March WET April – July	Daily (5 days/ week)	5	1200 bundles	₦10	₦12, 000	7th
7	Fuel wood (Red mangrove)	Log/ Bundles	DRY Nov – March WET April – July	Daily (5 days/ week)	5	900 bundles	₦200	₦180, 000	3rd
8	Herbs	Bundle	ALL	Occasional	2	-			

Source: *Authors' Field Survey, 2005*

From table 3, Fish and Cray Fish rank highest with respect to economic value of the resources extracted by the local population. A total of ₦294, 000.00 and ₦216, 000.00 respectively is derived from these resources per person per season of collection. This is followed by fuel wood extraction derived principally from the Red Mangrove (*Rhizophora racemosa*), and periwinkle with a value of ₦180, 000.00 and ₦120, 000.00 respectively for the collection seasons. Raphia palm comes last in terms of economic value of the most important resources extracted from the estuary. This however does not negate its very important social role in the entertainment, craft, home making and construction industry to local estuary resource users.

Table 4: Quantity of some Important Estuary Resources Harvested in 2005

S/n	Resource	Unit of collection/ sale	Season of collection	Frequency of collection	Quantity collected per trip	Total per season ₦	Total Quantity (KG)	Ranking
1	Fish	Basins/ Baskets	WET April – Oct.	Daily (5 days per week)	7	980 baskets	17,640	3RD
2	Cray Fish	Bags	WET May – Oct. DRY Nov – April	Daily (5 days/ week)	3	720 bags	14,400	4th d
3	Periwinkle	Bags	DRY Nov – March WET April – Oct	Weekly	5	240 bags	20,160	2n
4	Prawns	Bags	DRY Nov – Feb WET March – June	Daily (5 days/ week)	2	320 bags	4,480	6th
5	Timber	Logs	DRY Nov – March WET April – May	Weekly	7	160 logs	7,040	5th
6	Raphia Palm (Palm fonts)	Bundles	DRY Nov – March WET April – July	Daily (5 days/ week)	5	1200 bundles	81,600	1ST
7	Fuel wood (Red mangrove)	Log/ Bundles	DRY Nov – March WET April – July	Daily (5 days/ week)	5	900 bundles	14,400	4TH
8	Herbs	Bundle	ALL	Occasional	2			

Source: *Authors' Field Survey, 2005*

Also in table 4, it is shown that raffia palm/palm frot and periwinkle rank highest with respect to quantity of resources extracted by the local population. A total of 81,600kg and 20,160kg. respectively is derived from these resources per person per season of collection. This is followed by fish, crayfish and fuelwood extraction in the quantities 17,640kg, 1,400kg and 14,400kg respectively for the collection seasons. Timber and prawns resources comes last in terms of quantity of the most important resources extracted from the estuary.

The exploitation of estuary resources is largely driven by commercial motives as over 80% of the resources are sold while less than 20% are consumed.

LAND COVER CHANGE AND VOLUME OF RESOURCES HARVESTED

Air photo data (Flasse, 2002) covering 1991 to 2001 shows a very slight loss in estuary area between the period (see Table 5).

Table 5: Land Cover Change in the Cross River Estuary 1991 – 2001

S/n		1991	2001	Difference	%
1	Land Use	Area (ha)	Area (ha)	Area (ha)	Difference
2	Swamp Forest	52,000	57,886	5886	11 07
3	Mangrove Forest	48,000	47,675	-325	-0.68
	Estuary Total	100,000	99,361	-639	-0 64

SOURCE: Flasse, 2002. CROSS RIVER STATE COMMUNITY FORESTRY PROJECT, FORESTRY COMMISSION, CALABAR

The loss in estuary area between 1991 and 2001 is 639ha representing 0.64% of change in land area. An assessment of distance covered by respondents to harvest estuary resources (Table 6 and Figure 2) however betrays a significant subtle change in estuarine land area as extracts travel significantly greater distances to harvest resources such as fish, timber and fuel wood. While less than 1km was traveled to harvest fish in 1970, about 5km of travel is required to do same today. 8km and 7km of travel is required today (2005) to harvest timber and fuel wood resources respectively as against 1km in 1970. Travel time for resource extraction may thus be used as a reliable indicator of change in estuary cover and resources not captured from air photo data.

With respect to trends in the quantity of resources extracted from the estuary between 1980 and 2005, a steady decline may be observed in all major resources extracted (Table 7 and Figure 3). This range from 53 33% for fish harvest to 70 00% for Cray fish harvest for the individual collector. It is interesting to observe from the comparison of both figures 2 and 3 that while distance covered to avail oneself of these resources are on the rise, the quantity of resources available per individual collector is on a steady decline.

Table 6: Change in Distance Covered to Extract Estuary Resources

RESOURCES	DISTANCE COVERED PER YEAR (KM)							
	1970	1975	1980	1985	1990	1995	2000	2005
FISH	0 5	1	1 5	2	4	4.5	5	5
Cray Fish	0.5	1	1	1	1 5	1	2	2
Periwinkle	0.3	0 5	0.5	0 5	1	1 5	1 5	1
Prawns	0 3	0 5	0.5	1.5	1	1	1 5	2
Timber	1	1 5	2	4	5	6 5	7	8
Palms Frond	0.3	0.5	0.5	0.5	1	1.5	1.5	1
Fuel Wood	1	1.5	2	4	5	6	7	7
Herbs	0.3	0.3	1 5	0 3	0 3	0 3	0 3	0 5

Source: *Authors' Field Survey, 2005*

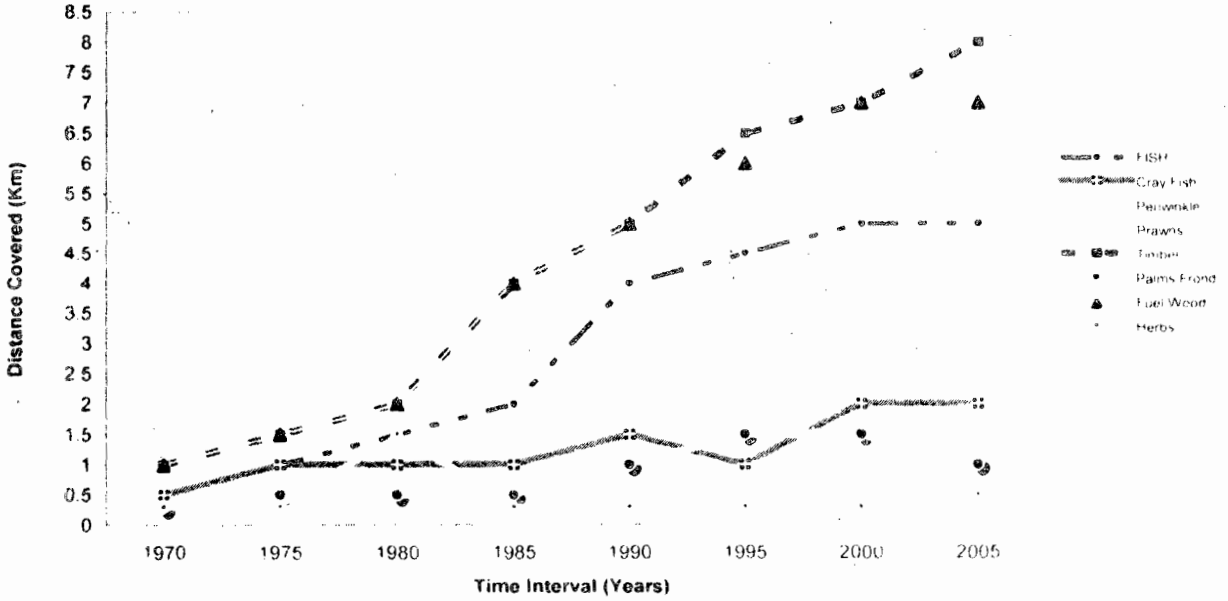


Figure 2: Change in Distance Covered to extract Estuary Resources

Table 7: Trends in Quantity of Resources Extracted from the Cross River Estuary 1980 – 2005.

	TRENDS IN QUANTITY OF RESOURCES EXTRACTED (KG)							
RESOURCES	1980	1985	1990	1995	2000	2005	Difference	% Difference
FISH	390	338	338	260	208	182	208	53 33
Cray Fish	200	200	140	100	100	60	140	70.00
Periwinkle	1125	750	600	600	375	375	750	66 67
Prawns	100	100	80	40	40	40	60	60.00
Timber	1000	1000	750	750	500	350	650	65 00
Palm Front (Raphia palm)	195	195	130	130	65	65	130	66 00
Fuel Wood (Red Mangrove)	300	260	260	200	100	100	200	66.00
Herbs	10	10	6	6	6	4	6	60.00

Source: *Authors' Field Survey, 2005*

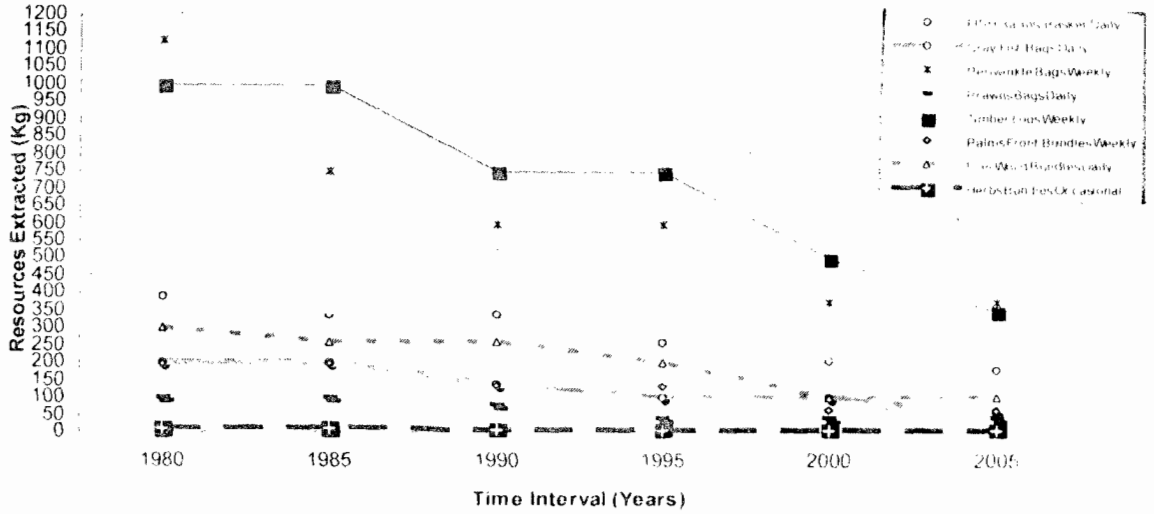


Figure 3: Trends in Quantity of Resources (Kg) Extracted from the Cross River Estuary

CHANGE IN QUALITY OF RESOURCE EXTRACTED

Changes in area cover, quantity and volume of resources extracted may also lead to changes in the quality of resources harvested.

It was for instance noticed that fishes were becoming smaller and tasteless due to their not being allowed to mature, as immature fishes are being harvested for both sales and consumption. This is the result of over harvesting due to increase in the demand for estuary resources and the growing population of resource extractions. The same problem was identified with crayfish, periwinkle and prawns extraction

The quality of timber and fuel wood resources being extracted in terms of log and wood sizes are becoming smaller as the year goes by. The only resource for which no significant change in stock and quality was expressed is herbs

EFFECTS OF CHANGE IN THE QUALITY AND STOCK OF HARVESTED ESTUARY RESOURCES ON LIVELIHOOD SUSTAINABILITY

The depleting stock of estuary resources is adversely affecting those resident in the region. Resident's alledge change in consumption pattern, and reduced protein intake as a result of loss of floral and faunal species. The income derived from exploiting these resources has reduced considerably and results in high level of illiteracy, poor housing quality, and poor health conditions.

The continuous depletion of estuary resources without a comprehensive management plan for their sustainability would result in severe social and ecological backlashes. Residents are not only traveling longer distances to harvest these resources (Figure 2), they are getting lower returns for labour extended as the year goes by (Figure 3). The trend is towards an inevitable ecological collapse of the estuary as a life support system and its associated threats if an effective management system is not put in place

PRESENT LOCAL MANAGEMENT REGIMES FOR ESTUARY RESOURCES

While this vital resource area is yet to be put into any form of management plan via the public domain as in the creation of a Forest Reserve or Protected Area System, evidence of local management response to its dwindling resources by the indigenous populations living at its margins may be observed

These management strategies are being put in place by the community leaders in the various settlements using "Ekpe" (The Leopard Society) as a symbol of authority. These strategies lay emphasis on the size and age of resources to be extracted and types of resources to be exploited at certain periods of the year. For example, the use of dynamites and gamaline for fishing are forbidden

Failure to comply with the stipulated rules and regulations have consequences for which defaulters may have their fishing equipments such as nets, hooks, baskets and canoes seized and destroyed. In extreme cases of default, the offender could be excommunicated from the settlement. The laws are strongly adhered to by both the community members and the resource extractors and buyers

CONCLUSION

A clear focused and comprehensive management plan needs to be put in place for the management of the Cross River Estuary. This is in the face of declining resource stock and yield of the most important resources being harvested by those dwelling around the resource complex and the associated loss in the biodiversity of the region

The area needs to be integrated into the network of National or State Protected Area Management Systems with a strong focus on Participatory Management Strategies that meaningfully engages the present local resource users towards imbibing the culture of sustainability. The present local management regimes, which seems to be respected should be further developed and incorporated into the National system of Protected Area Management

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