

The Nigerian Mangrove and Wildlife Development

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Introduction

The Nigerian mangrove ecosystem is mostly fragmented deltaic formation located in the River Niger Delta. Occasionally what should have been continuous and uniform mangrove forest in the Delta Islands are interrupted by beach Ridge Island forests sandwiched between the coastal beaches and the estuarine mangrove and island within the mangrove forests. The beach ridge forests typically contain lowland rainforest species. Some have large areas of high quality forests with high concentrations of biodiversity as in Andoni area.

All the major towns and rural mangrove dependent communities such as Abonnema, Bonny, Buguma, Brass, Nembe etc in the Niger Delta area located on such beach ridge forest Islands within the mangrove ecosystem.

Greatly influenced by both downstream freshwater flows and upstream diurnal tides, the mangrove forests have low plant species diversity and elevated productivity. Although the standing biomass is low averaging 150 ton per hectare, productivity is known to be relatively high – 15 to 20 ton per hectare per year for river mouth and creek edge stands. Productivity is lower for the inner mangrove zones which are composed mainly of stunted trees. The litterfall and accumulation of organic matter are the basis for aquatic food chain linking decomposers to marine and estuarine fish, mollusks (such as oysters and periwinkles), and crustaceans (especially shrimp and crabs). The sustainable productivity of the mangrove in these life-sustaining products is the major concern of the Nigerian mangrove communities.

Fragmentation, deforestation and degradation of the mangrove ecosystem by petroleum exploration and related industrial activities and domestic uses are major concerns to the mangrove communities, the Nigerian environmentalists and conservationists.

Community struggles in the Nigerian mangroves are directed towards operators of petroleum and allied industries for provision of alternative employment, healthcare facilities, improved rural technologies etc in place of destroyed life-supporting mangrove bases. The struggle manifests as various levels of protests, demands criticisms and occasionally violent demonstration by the aggrieved youths of the Niger Delta areas, particularly oil producing communities. This chapter presents features of the Nigerian mangrove ecosystem, some cases of communal ecosystem deforestation and degradation and measures taken to restore them for the benefit of the rural communities.

Size and Floristic Compositions

Nigeria has the largest mangrove forest in Africa and the third largest in the world. The mangrove forest extends from Badagry in the West to Calabar in the East covering a total area of 10,000km² along the coast. Defined by regular saltwater inundation, the mangroves form a vegetation band 15 to 45km wide paralleled to the coast. The mangrove region is widest on the sides of the Niger Delta 35 – 45km and narrows towards the centre to a width of 15km except for the channel of the Brass River, which has extensive mangroves far

upstream. Acid sulphate, silty clay, clay loam and peat locally called "chikoko", soils predominate in the mangroves. They tend to be saline and have almost neutral pH when wet. However, when the soils are exposed and thus become dry, the sulphides are oxidized to sulphuric acid, rendering the soil very acidic with pH 3. Bare areas which characterize mangrove areas dredged for petroleum well development are results of oxidation of acid sulphate mangrove soils exposed during dredging. At pH 3 to 3.4 which characterize such dredge spoil dump areas the soil appears too toxic for plant establishment.



The mangrove forests of Nigeria comprise principally only three families and six species as follows:

1. ***Rhizophoraceae* (the red mangrove):-**

Rhizophora racemosa, *R. harrisonii* and *R. mangle*. Of these *Rhizophora racemosa* is the most abundant taking about 90% of the mangrove forests. It occurs at the outer body of water. It forms a dense growth throughout the region. It is also the biggest of the three species attaining heights of up to 40m and dbh>90 cm at maturity. Being a pioneer, from the water body, it is followed by *R harrisonii* which attains heights of 5-10m and *R mangle* with heights less than 5m. In their distributin, *R harrisonii* occurs usually between *R racemosa* and *R mangle* the latter occupying the harder parts of the mangal soil.

2. ***Avicenniaceae* – (white mangrove) *Avicennia africana*.**

3. ***Combretacea* – *Laguncularia racemosa* and *Conocarpus erectus*.**

Nypa fruticans (Nypa Palm) an exotic palm has spread through the Eastern Delta and is common around the mouths of the Bonny and Imo Rivers. This exotic species has high national income value in its natural range where it is also cultivated and sustainably managed. So far attention is not being paid to its management in Nigeria. In degraded areas, sedges, grasses especially *Paspalum vaginatum* and the fern *Acrostichum aureum* thrive.

The most striking feature of the mangrove forests of Nigeria is the zonation of the dominant species more or less parallel with the shoreline, each zone except the overlap, consists of one tree species. Zonation is related to the physiological characteristics of the different species, corresponding to the frequency and

duration of tidal immersion, soil compaction, the extent of accumulation or erosion of soil and the salinity of the ground water.

Zonation suggests that there is a succession associated with aeration and subsequent changes in the level of land in relation to the water. The growth of vegetation in a particular zone also helps to create conditions for another plant association so that one community succeeds another until eventually an island type of vegetation not tolerant of sea water is established.

Rhizophora racemosa, being a pioneer grows on the soft muddy banks of the brackish creek. It is followed by the shorter *R. harrisonii* and *R. mangle*, which progressively prefer drier habitats. *Avicennia africana*, *Laguncularia racemosa* and *Conocarpus erectus* are progressively found on firmer landward grounds.

The Mangrove Soils

The dominant feature of the Nigerian coast is the Niger Delta which consists of swampy ground separated by narrow fresh or brackish lagoons (around Lagos) and anastomosing creeks. The network of creeks, separated by muddy deltaic deposits is not stable, since changes in currents and the rate of flow of the river causes erosion of materials already deposited and deposition continues to extend outwards.

Mangroves occur on the muddy banks of creeks where the water is brackish. Two soil types are roughly distinguished:

- (a) The soft mud area with "tall" *Rhizophora racemosa* (bordering the water courses in small bands of usually $\leq 100\text{m}$).
- (b) The relatively hard fibrous mud with a level surface just below high tide level with short, *R. mangle*. The three *non-Rhizophora* species occur in very limited areas and numbers and are economically unimportant except for limited uses.

Rhizophora racemosa can grow to tall heights and grows best under brackish water influence. *R. harrisonii* and much more *R. mangle* can stand higher saline concentrations. They are found on compacted soils formed of fibrous materials accumulating faster than decomposing, thus forming with increasing age a higher elevated increasingly dense layer, locally called "chikoko", with high saline concentration. A succession from *R. racemosa* to *R. mangle* can be identified, *R. mangle* grows only to scrub height mainly on tidal flats. Treeless areas of "chikoko" mudflats are expanding on account of extremely high salt concentration. An estimated area of 40,000 ha. of unproductive "chikoko" exists in the Nigerian mangroves.

The time required for the transition from fresh alluvium to mature "chikoko" is about 100 years. Usually the Niger deposits enormous quantity (up to 40 million tons) of fresh silt annually into the system. There is also continuous erosion and redeposition of "chikoko". In the transportation of the silt, the wash-load is subjected to consolidation, drying, oxidation, reduction and salinisation. Mangroves colonise the silt with the formation and incorporation of organic matters and the resultant accumulation of ferrous sulphide which renders the soil unsuitable for the growth of tall mangrove, *R. racemosa*. The circle is completed by the erosion and redeposition of the soil which promote further chemical changes and the conditions suitable for the colonizing mangrove are once more restored.

Yield and Utilization

Yield data for the Nigerian mangroves suggest that accurate information is yet to be established. Earlier estimates suggest that the Nigerian mangrove forests carry an enormous stock of standing volume. With a conservative estimate of 250m³ per hectare the total volume of mangrove in Nigeria is estimated at 250

million m³. However, a recent calculation indicates that Nigeria's mangroves would have a total standing volume of 30 million m³ and exploitable volume of 10 million m³.



Except for traditional uses mangrove species are not currently commercially utilized in Nigeria. In addition to fuel wood, local communities collect large variety of mangrove products such as food (crabs, shrimps), honey, medicine, dyes, thatching and numerous other household products from the mangroves. Mangrove salt and periwinkles (*Tymopanonus fuscatus*) are both important income sources for local people. Generally, the fishing population in the mangrove area are dependent on the mangroves to all intents and purposes.

Ownership

Traditionally mangrove swamps are community-owned. Communities rather than individuals held rights to most rural land. Today all land is legally vested on the state government though individuals and communities continue to use the land. The Federal Government owns all mineral rights. This is a source of anger and protests for communities in which oil developments is going on, as the industrial exploitation of natural resources from lands occupied by the rural communities does not appear to benefit such communities and has even led to impoverishment of agricultural soils on which the communities depend for livelihood.

Threats to the Mangrove Ecosystem

The Nigerian mangrove forests were earlier considered to be the least disturbed of the forest zones of Nigeria. That is not the situation today. In order to develop the Niger Delta areas, canals and road construction have been extensive since 1980. The Nigerian Oil Industry is located mostly in the mangrove forests. The activities of the numerous oil exploration companies have led to fragmentation, deforestation and degradation of the mangrove forest ecosystem. For example Shell Petroleum Development Company alone has shot over 120,000km of seismic lines and created vast degraded bare areas (yet to be estimated) resulting from dredging activities in the mangrove forest. Impacts of other petroleum development companies such as Mobil, Elf, Agip, Chevron on the Nigerian mangroves are yet to be estimated.



Since slots and canal creation do not consider the impact on local communities and ecosystems a lot environmental degradation and linked socio-economic problems are common. Destruction of fishing grounds and forest die back are just but a few such problems.

Mangrove Silviculture

The Nigerian mangrove is not being managed although it has potentials for numerous industrial uses. Consequently no standard silvicultural systems have been established. However, the "tall" *R. racemosa* has been recognized as the species with dependable potential for several industrial uses. It is good timber, and tannin/rayon source species. The Forestry Department of the Rivers State University of Science and Technology, Port Harcourt, Nigeria, has been investigating nursery and plantation techniques, for *R. racemosa*. With the use of inorganic fertilizer the sprouting time of mature *R. racemosa* propagule has been reduced from 35 to 20 days. The seedling is ready for planting out in three months with six foliage leaves.

A seven year old *R. racemosa* plantation established with nursery-raised seedlings on four (4) hectares of "chikoko" mudflats recorded $88 \pm 1.5\%$ survival, $5 \pm 0.2\text{m}$ mean height, $5.5 \pm 0.2\text{cm}$ mean dbh and 6.0m^2 mean crown cover in vigorous and good form. Studies of the natural regeneration patterns of the mangrove species indicate that natural regeneration is very inadequate and slow inspite of the enormous number of propagules produced per tree. It also shows a lot of population clustering in the order tree \geq seedling sapling. At maturity natural stand spacing is $\geq 3.6\text{m}$.

Conservation

The depletion of the Nigerian mangroves is a cause of serious environmental and economic concern. It is clear that serious depletion of the Nigerian mangroves is increasing markedly without sufficient monitoring, concern, or thought.

The biological and ecological importance of this Nigerian estuarine wetlands necessitates their conservation and management especially as society is now looking to the shallow coastal seas and estuaries to augment the supply of protein. The continuing deforestation and degradation of the mangrove resources

will reduce, not only the terrestrial and aquatic production and wildlife habitats but more importantly resource availability to the dependent rural communities which will be seriously impaired.

As a measure to educate and involve the dependent rural communities in mangrove conservation, the Mangrove Forest Conservation Society of Nigeria (MFCSMN) an NGO has acquired a 9 hectare piece of land at Iwokiri in Ogu/Bolo Local government Area of Rivers State of Nigeria for establishment of a Integrated Mangrove Conservation and Research Centre. It is a community-based poverty alleviating project. The objective is to foster mangrove conservation, development, utilization and self-supporting education. It is estimated to cost N381,292,358.37 about \$3,631,355.00.

This is the first and most positive step taken in Nigeria towards improving the mangrove-dependent communities by providing utilitarian conservation and sustainable self-supporting education. As a pragmatic, commodity-based and an adaptive integrated research and training institution, financial, technical and positive supports from organizations world wide shall have contributed immensely towards the development of the mangrove-dependent communities in Nigeria. It is a sustainable new dimension.

Rehabilitation of Degraded Bare Mangrove Soils

Characteristic of Nigerian petroleum development wellheads, slots and canal construction in the mangrove forests are several hectares of elevated dry, bare (void of any vegetation) and degraded mangrove soils. The Nigerian mangrove soil is an acid sulphate soil with pH 6.2 to 6.6. Containing Iron pyrites (FeS and FeS_2). Dredge spoils from petroleum well slots and canals in mangrove forests are dumped extensively around the wellheads, and canals one to two meters far above tidal floods. The continuous exposure of the soils to atmospheric air leads to oxidation of the pyrites and the formation of sulphuric acid (H_2SO_4) which is abundantly released unto the soil reducing the soil acid level to pH 3. Under the hot tropical condition no plant can survive under pH 3 soil acidity hence the dredge spoils dumps remain bare, void of any vegetation. It is common to see 10 ha of such bare areas in a single location at an average of 3ha per slot. The total area has not been determined for the entire Nigerian mangrove forests.

Foresters in the River State University of Science and Technology, Forestry Department have been able to evolve re-vegetation technique for the bare areas by woody species selection and without external inputs such as fertilizer or lime. These include *Syzygium guineense*, *Dalbergia ecastaphyllum*, *Alchornea cordifolia* and *Chrysobalanus icaco* all indigenous to the area and appear naturally adapted to the acid condition but have to be planted in the rainy season.

This soil therefore supports lowland rainforest species and have potential for agro-forestry after re-vegetation as the nutrient levels are adequate for food crop production. Low pH is the only problem of the area. Rehabilitation of these disturbed mangrove soils will provide further opportunity for food production among the mangrove communities.

Some Important Wildlife of Nigeria

The available composition of the mammalian fauna has been documented by some researchers. (Brown, 1967; Howell, 1968; Child, 1974; Pelink, 1974; Milligan, 1979; Omoniwa, 1984 and Abere, 1986). These studies reflect those species which are associated with Sudan-Guinea Savanna woodland and include roan, hartebeest, oribi, hunting dog and Patas monkey. Species associated with perennial water system are waterbuck, kob, reedbuck and green monkey. The major species associated with fringing forests is the red-flanked duiker, Hippopotamus and Manatee which occur in pools and rivers. At least 12 orders of mammals have been identified, 55 of birds, 3 of reptiles; 9 spp of amphibians, 14 orders of fish have been documented on the Borgu Sector of the Kainji Lake National Park alone.

Wildlife Conservation

Wildlife development efforts of government have been geared towards, protecting all known animal species in Nigeria from extinction. Other objectives of wildlife programmes include its conservation for sustained production of animal protein and for tourism. Specific projects and activities geared towards improved management of Nigerian wildlife resources include the development of National Parks, establishment and management of wildlife breeding centres; implementation of endangered species Decree No. 11. of 1985; establishment of wildlife rescue centres; and monitoring of wildlife habitat, and population. The financial allocation, N31.8 million by both Federal and State Governments in the last development plan, 1981 – 1985, is expected to be substantially increased in future plans.

In 1985, an endangered species Decree was promulgated in order to give municipal effect to the convention on International Trade (and traffic) in Endangered species of fauna and flora (CITES). This decree has provisions that seek to stop illegal trade in endangered wildlife and wildlife products.

It has been severally discussed that wildlife in many of the reserves has been decimated almost to extinction. In fact there are few surviving wildlife around areas of high human population density. The tendency to finish what is left of Nigeria's wildlife by illegal hunters has prompted the government to enhance anti-poaching campaigns and patrol of conservation areas through adequate and timely funding.

Proposals for the creation of more conservation areas of varying status are being considered while two wildlife Rescue Centres are about to take off. These programmes may ultimately be used to enhance insitu conservation through re-introduction of some animal species into their original habitats.

Domestication of wildlife species seems to be the alternative to poaching if the popular 'bushmeat' delicacy of Nigerians will be sustained. The emphasis is on people being continuously encouraged to raise some wildlife species at the back yard or some other vantage areas of their living premises. Species that are encouraged are, the guinea fowl, African giant snail, grasscutter, and cane rat.

Problems of Wildlife Development

Perceived Problems

These include lack of knowledge. A state in which both government and the people are either not informed or are inadequately informed of the need to develop the wildlife resources naturally available to them. The wildlife and wildlife resources are often taken for granted – i.e. as nature's gift to man and so may not need fending or replenishment enhancement. A situation where people go into the bush and kill by trapping or shooting animals without regard to sex or age.

In some cases where due to sheer experience or continued prolonged exposure to relationship with wildlife, - animals and other life - forms of note people have noticed reduction in population or instability in animal incidence and abundance, hunters still do their thing – crop all available individuals to satisfy the "needs" of the people. This is a problem because whereas the need is there for protein supplement, the renewability of the resources is compromised. This really should be opportunity cost reality – to kill out or to source for alternative.

The other or seeming only alternative is that of domestication. Domestication of wildlife species comes with it a whole of problem the greatest of which is probably SOCIAL ACCEPTANCE of the domesticatable species.

Scientists have outlined the domestication process but this is clad with economic problems associated with litter size weight (body) growth rate and protein quality. All these are purely economical, difficult to overcome as they are there poses a rather stiffer problem that of social taboo. Most wild species are either totems or deities in certain parts of the country and indeed the world. Superstition prevails over realities.

Established Problems

These are problems of enforcement of laws, regulation and rules / legislation due mostly to inadequate sanctions and or lack of corporate will. The skin of a python would yield fine handbags, belt and shoes etc. that would fetch about N10,000 (ten thousand Naira) and that python would have lived for 10 – 20 yrs but the law stipulates a fine of N500 for killing a python. The result is that poachers will dare to kill the python and pay the fine if caught than obey the Law. Also just 2 elephant tusks may cost N2m, (two million Naira) but the meat only about N500,000 and the fine to pay on killing an elephant illegally is N300,000 so the poacher again opts to kill the elephant and if caught prepares to pay N300,000 and makes a gain of N2,200,000.

Another problem is that of Government lording it over the community that actually owns the bush as the very community members will be the chief defaulters. They must be told why they must not harvest forest products.

Indirect Development

In the mangrove ecosystem, the coastal ridge barrier forest lands, wildlife development had been more indirect than direct. In fact there has not been any programme planned to develop the wildlife of the mangrove areas, the deltaic systems and the coastal barrier island regimes in Nigeria. Attempts have been made at conservation efforts nationwide and forest protection but the wildlife status has not even been properly documented in the mangrove areas.



However, the wildlife is undergoing steady development due mainly to native laws and customs as most creeks, rivers and streams are communally owned or controlled. There are rules and regulation for use of these natural resources. There are also beliefs and traditional authorities on some if not all the natural resources available to the "waterside people".

These community members maintain SACRED places, sanctuaries and refugia, connoted differently as EVIL FORESTS, shoreline/river bank, shrines (mermaid houses). The result is that most animals finding peace, tranquility and safety in such places would rather always resort to the places than roam and be killed by poachers who will never venture into such prohibited places. These places now become protected areas as our parks, zoos and ranges.

Effects of Deforestation

When terrestrial land areas (bushes) are exploited for whatever reason(s) such as clearance for agriculture, infrastructural development or mineral prospecting – (seismic activities) etc, the result is deforestation. When this occurs, vegetation covers are removed and the animals feel naked and forced to move. This forced

migration of the various species of wildlife can be both advantageous and disadvantageous to the wildlife. They would be forced to run into predators or inadvertent danger – death or injury by machines or drowning for those that cannot swim. They can if lucky to escape all dangers, find themselves a safe refuge and blossom-increase in population. They may also be exposed to researchers who would not have been able to locate them before the deforestation and so be enlisted for studies. This will also trigger off survivorship instinct in them and make them alive resulting to succession and better adaptation to the new environment they find themselves.

Forced Coexistence

Another way wildlife in the mangrove ecosystem have been developed is inevitable exposure to man and other rather unacceptable species. A situation where antelope would be visiting the creeks and rivers to rummage for food. The antelope is a herbivore and does not feed on animals but require the cover of the dense mangrove forest since there has been a clearing of the vegetation up land. The antelope is not amphibious as it cannot live inside water but it evolved to be a good swimmer and can outwit its predators that cannot swim by associating with the mangrove environment. Common species in this system are the reptiles, birds and insects. The only mammals being hippopotami and manatee.

Some natural disaster such as wind throws and thunderstorm have resulted in decimation of the coastline, riverbank ecosystems to the end that an intermediate zone is created between the shoreline and the pure terrestrial land. Most fringing forest species of wildlife result from such actions and even the large mammals are cut up in what is more brackish than saline water body and they thrive there. There too they are protected as many hunters will be searching for them either up land or in the rivers.



Certain reptiles and carnivorous mammals lurk around living accommodation to prey on domestic animals because they cannot cope with the exposure of the disturbed forest for hunting – pythons seizing hens and goats and foxes stealing meat from homes. Some birds of prey hanging out around village settlements for careless domestic fries etc. All these constitute partial domestication of wildlife species as they soon lose their fear for man.

Wildlife development therefore follows closely the forest development efforts since one could hardly talk of wildlife without mentioning vegetation and so with soils.

Conclusion

Mangrove land use does not appear to generate competition in Nigeria. Community struggles are directed toward alternative income-generating employment of direct compensation for damaged, polluted or utilized community life-supporting base, the mangrove forest, by industrial development operators. This is because the deltaic nature of the mangrove forests confers limited and specialized species on the ecosystem.

Nigerian foresters have succeeded in determining woody plant species that can be used to revegetate exposed bare toxic dredge spoil dump sites. There is, however, need for research to determine pragmatic and adaptive integrated land use potentials of the mangrove areas in the face of man-induced decline of the productive potentials of the ecosystem.

The Mangrove Forest Conservation Society of Nigeria has positively proposed an Integrated Mangrove Research and Training Centre (IMRTC) for sustainable mangrove utilitarian conservation skill development among the dependent communities. This needs recognition and various supportive contributions and encouragement.

An exclusive mangrove land use policy has become very necessary to save the remaining forests and ensure mutual development of the communities and the wildlife therein.

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