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THE NYPA (*NYPA FRUITICANS*) THREAT IN ESTUARIES EAST OF THE NIGER DELTA, NIGERIA.

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ABSTRACT

When Nypa fruticans was introduced into the mangrove swamps of the Niger Delta in 1906, the ecological consequences that could follow its spread was never considered. The biological characteristics of the true mangroves, exemplified in slow growth, encouraged Nypa spread. The almost fluid mass of the mangrove soils have been changed into dense fibrous peat by Nypa rhizomes. The displacement of indigeneous Rhizopora racemosa, Rhizophora hareisonii and Avicennia africana (Avicennia germinans) by Nypa fruicans is a serious ecological threat to mangrove bio-diversity. A holistic approach of integrated coastal zone management is advocated for the control of Nypa palms invasion and the regeneration of mangroves along the deltaic coastline.

Keywords: Estuaries, Ecosystem, NigerDelta, Nypa fruticans

1. INTRODUCTION

In Nigeria,the major palms found are the oil palm (Elaeis guineensis), the rafia palm or wine palm *(Rafhia hookeri or R.vinifera)*, the coconut *(cocos ucifera)*, the wild date palm *(Phoenix reclinata)* and *Nypa palm (Nypa fructicans or N.fruticans)*.

The Nypa palm which is the subject of this paper belongs to the family Nypodae and the sub-family Nipah. It has one genus Nypa and one species *Nypa fruticans,* also referred to as *N. fructicans* Thumb. Nypa has feather palms with horizonsta underground branching rhizomes. The leaves have reduplicate leaflets without a terminal leaflet. Nypa is monoecious and the inflorescence is sub-terminal. It has an erect stout stalk with many tabular sheathing spathes and central globose head of female flowers surrounded by many short spikes of male flowers (Ukoima 1998). The female flowers have minute sepals and petals with three that open by a spit to one side of the tip but with two not developing. The male flowers are smaller with three sepals and petals and anthers three on a single column. The fruits occur in globose heads, has big angular nuts which are fibrous with a woody stone and seven seeds, penetrated on one side by its wall (Zeven 1963) la, 1b, 1c)

2. HOW DID NYPA PALM GET INTO THE NIGER DELTA

Nypa palm seeds were brought from Sinapore Botanical Garden in 1906 and planted at Old Calabar in the former Eastern Nigeria (Keay 1953, Seven 1963). The original home of the palm is therefore SE Asia, Malaysia, Indonesia, Philippines, Singapore, Vietnam and Cambidia etc), Nigeria is an adopted home of the Nypa palm. Of the seeds planted at Calabar, only 29 germinated. Between 1911 and 1912, about 1,200 seeds were harvested at Calabar and nine hundred of the seeds were planted at Oron while 300 were planted at Opobo. Umoren (2001) records that the plant was brought in to check erosion in the coastal towns of Calabar and Oron. The Eastern Nigerian Department of Agriculture, in 1945 initiated the importation of more Nypa plants into the Niger Delta presumably to provide the inhabitations with a crop more valuable than mangroves. In 1946 a total of 6,640 seeds were planted as detailed: Bonny 1250, Oloibiri, 950, Nembe 50, Abonnema 890, Port Harcourt 850, Bolo 700, Degema 600, and Brass 500. The success of this programme is reported at Kono near Opobo where 108 seedings germinated. However, Nypa failed to provide a new and better crop than the mangroves.

In its early days, Nypa failed to provide species, which encouraged it to spread rapidly. In Opobo, the palm enjoyed such protection that nobody was allowed to interfere with its spread. Persons who attempted to uproot the palm were prosecuted and imprisoned.

3. DISTRIBUTION OF NYPA IN THE NIGER DELTA

Although the distribution of Nypa stretches from India to Queensland (Australia), the palm is doing equally well in Nigeria, particularly in the river estuaries east of the Niger Delta (Fig. 1). But unlike in its native habitats where it is used for the production of vinegar, sugar, alcohol and beverages and for thatching and making of baskets, Nypa palm does not seem to have any economic use in Nigeria except as thatch (Holzlohner and Nwosu 1997). As reported on the Niger Delta by Wilcox (1985) Nypa is displacing the natural mangroves of the Cross River and Imo River estuaries. Nypa palm has colonized the beaches as aggregates of it are common sights along the coast. Washed off nypa are also deposited at beaches, water ways and slip ways, constituting a nuisance for navigation.

Powell (1994) observed that Nypa spread and growth is limited in the Central axis of the Niger Delta. This was related to the nutrient-rich detaic flood and prolonged freshwater inundation. Of importance however is that Nypa spread has been east-west in direction and favours areas with appreciable tidal range and vegetated mud flats where the seedings could be trapped to grow. Hence, the central axis of the Niger Delta is a potential nypa habitat.

Nypa of the Niger Delta may be classified into the following physiographic types:

(i) Swamps of the inland freshwater/saline interface where large upland water imports make the swamps almost fresh particularly in the rainy season. Soil salinities range from between 0.1% in the rainy season to 2.0% in the dry season, for example at Creek Town in the upper Calabar River estuary.

(ii) Swamps occurring as basin wetlands between the raised levees of two parallel water channels, creeks or rills. This occurrence is responsible for the appearance of Nypa palms within a dominant mangrove grove.

(iii) Narrow swamp on the slip-off slopes of meanders where sediment deposition creates conditions for nypa propagation.

(iv) Overwashed or brained island swamps located in the middle of river channels e.g. the Cross River estuary.

(v) Various minor swamps which are tidal, no matter how far inland they are located.

Nypa is well developed in density and structure irrespective of whether the swamps are of the open or close type. Open swamps are those that are permanently connected by an outlet tidal body or sea while closed swamps are those having seasonal outlet during the rainy season.

Nypa distribution could perhaps be better understood also in relation to the morphology of mangrove habitats where other species also occur in mixed stands. Although Nypa is generally associated with alluvial swamps, they may occur and propagate on the abandoned beaches if sheltered from direct ocean waves. That is, Nypa growth dominate on allochthonous swamps- with dominant clastic sedimentation derived largely from outside the framework of the swamp. Mixed swamps of allochthonous and authochthonous (in situ) sediments often result in poor stunted growth. (Ukpong, 2001).

3.1 Mangrove Habitats and Relationship with Nypa Growth

The following mangrove physiographic habitats are associated with nypa growth (Ukpong 1995, 1997)

(i) **Distributary Channel Habitats (DC):** These are riverine mangrove wetlands in which the channels display evidence of abandonment and infilling of recent meander scars. The habitats may also assume the form of basin wetlands where despression of species on this habitat is:
R. racemosa > *N. frutican* > *A. Africana*
> *R. mangle* > *P. reclinata* > *Raphia spp.*
> *T. rhomboideae* > *H. Tilaceus*

(ii) **Point-bar Habitats (PB):** These are found where there is intense sedimentation on the slip off slopes of meanders. Being regularly washed by strong current, minor channels within channels terminate in permanent ponds or sandy/muddy surface in the landward surface of the swamps. The sequence of flood tolerance of species on this habitat is:
R. racemosa > *A. africana* > *R. mangle* > *N. fruticana* > *R. harrisonii* > *Raphia spp.* >. *candetabrum*

(iii) **Braided Channel Habitats (BC):** These are over washed island habitats formed as a result of sedimentation within the river channels. They are longitudinal bars orientd with the channel flow, and are ringed by the channels to form "islands" or "braids" and are flooded daily by tides. Species flood tolerance sequence on these habitats is:
N.fruticana > *R. racemosa* > *P.candetabrum*
A. africana

(iv) **Interdistributary Basin Habitats (ITD):** These are low-lying areas between distributary channels. They are basin mangroves wetland characterised by seasonal freshwater flooding with some of the water localized in silting ponds. large quantities of sediments are supplied to the swamps seasonally by heavy rainfall and wider tidal inundations. The sequence of flood tolerance of species is of the order:
R. racemosa > *A africana* > *N. fruticans* > *R. mangle* > *D. lunatus* > *P. redinata* > *Raphia spp.*

(v) **Wooded Levees (or Fringe Mangrove Wetlands (WL):** These are natural levees and are most common. The levees have variable width and merge inshoreward into the low fresh water swamps. The floods tolerance sequence of the species is of the order:
A. africana > *R. racemosa* > *N. fruticans* > *mangle* > *R. harrisonii.*

(vi) **Tributary Creek Habitats (ITC):** These occur along tributary creeks that join the river estuaries close to the beachridge sands. The flood tolerance sequence of species is of the order:
A africana > *R. mangle* > *N. fruticana* > *R. racemosa* > *T. rhomboideae* > *Raphia spp. P candelabrium*

(vii) **Inter-riverine Creek Habitats (IRC):** These occur along inter-rivine creeks such as Stubbs Creek that connect the Kwa Iboe River and Cross River estaries to each other through the beachridge sands. Lying close to marine influence the habitats are chereterised by alternating erosion and deposition of sands due to strong current and tides. Nypa is insignificant on this habitat. The sequence of flood tolerance of species is:

A africana > R. racemosa > P. candelafbrium >

R. mangle > R. hookeri.

(viii) **The Beachridge Strand Habitats (BR):** Along the Alantic shoreline occur strand or dune habitats. Ebbflood channels separate the beachridges from each other. The habitats are not inundated by diurnal tides but ocean waves cause the deposition of coarse on the shoreward slopes. Nypa is insignificant on the beachridge habitats. The sequence consists of *Sesuviun portulacastrum, Ipomoea cairica, Remeiria maritima and Sporobolus viginicus as pioneer species while Philoxerus vermicularis, Cyperus articulans, Heteropogon spp and Crysobalanus orbicularis* are the main strand species.

Variation in species density and importance is reflected on the habitats which indicate the ecological significance of the species on the habitats and their relative ability to compete with each other under the prevailing environmental conditions.

Table 1: Abundance of some overstorey species among 7 physiographic habitats (Density in Stems/hectare). Parentheses indicates the number of 100m^2 stands sampled.

Habitats Number of quadrats	**DC (10)**	**PB (8)**	**BC (13)**	**ITD (16)**	**WL (13)**	**TC (6)**	**IRC (9)**
Species (Stems/hectare)							
A.africana	130	150	-	144	246	283	233
N.fruticans	90	-	200	100	84	83	-
R.racemosa	80	138	69	100	84	50	89
R.mangle	50	75	54	63	84	100	56
P.reclinata	40	-	-	100	-	-	-
Raphia spp	60	50	-	-	-	-	-
R.harrisonii	-	25	-	-	31	-	67
Other stems	110	25	177	56	-	100	33

Table 2: Abundance of understoorey species among 8 physiogrphic habitats (Density in stems/hectare). Parentheses indicates the number of 100m² stands sampled.

Habitats Number of quadrats	DC (10)	PB (8)	BC (13)	ITD (16)	WL (13)	TC (6)	IRC (9)	BR (9)
Species (Stems/hectare)								
A.africana	230	230	38	231	583	283	442	300
N.fruticans	110	38	38	131	-	117	-	-
R.racemosa	270	425	108	306	130	67	178	230
R.mangle	270	225	100	150	308	117	189	-
C.erectus	110	25	-	-	-	-	-	-
Other stems	125	139	61	225	31	316	78	20

Table 3: Abundance of saplings among 7 physiographic habitats (Density in sapling/ hectare). Parenthesis indicate the number of of 100m² stands sampled.

Habitats Number of quadrats	DC (10)	PB (8)	BC (13)	ITD (16)	WL (13)	TC (6)	IRC (9)
Species							
Mangrove	160	1325	362	369	2092	1367	333
N.fruticans	90	125	515	150	323	150	33
Raphia ssp	20	138	-	44	26	17	12
P. candelabrum	20	25	154	50	6	34	22
Other saplings	30	13	-	19	8	43	39

Table 1-3 show the relative abundance of *Nypa fruticans* on the physiographic habitats. In the overstorey, Nypa dominates the braided channel habitat (Table 1) (Ukpong 1992) and tends towards dominance in the distributary channel and interdistributary basin habitats. In the understorey, Nypa growth has increased on five habitats showing dominance also on the braided channel (Table 2). Nypa salping densiy is also highest on the braided channel habitat (Table 3). However, density alone is insufficient as a measure of ecological dominance since it does not incorporate crown cover of species as an ecological factor. Crown cover determines the level and intensity of competition among the species. To express the ecological dominance of species, the relative density and relative coverage value of the species are summed to obtain their ecological importance values.

Table 4(a) Ecological importance values of overstorey species in 7 physiographic habitats.

HABITAT	DC	PB	BC	ITD	WL	TC	IRC
Species							
A. africana	61.0	83.4	22.2	74.2	126.3	125.6	137.5
R.racemosa	40.9	94.2	46.6	46.1	44.8	26.3	56.3
R. mangle	33.0	55.5	38.3	57.6	57.8	55.1	38.7
N.fruticans	91.7	-	144.8	95.5	120.8	86.1	-
Raphia spp	42.2	33.2	6.1	15.7	-	16.3	-
R. harrisonii	9.1	-	46.2	-	-	12.6	6.2

Table 4(b) Ecological importance values of overstorey species in 8 physiographic habitats.

HABITAT	DC	PB	BC	ITD	WL	TC	IRC	BR
Species								
A. africana	51.2	60.1	36.8	68.0	135.9	100.1	137.2	144.0
R.racemosa	48.7	97.4	89.6	79.2	42.9	34.5	65.7	135.1
R. mangle	57.3	6.4	73.1	38.3	83.4	39.0	56.0	-
N.fruticans	76.5	56.2	98.6	101.5	-	99.0	-	-
R. candelabrum	9.8	18.7	30.9	6.2	5.4	31.2	-	-
Raphia spp	31.5	13.7	-	8.7	-	16.1	7.9	-
B.harrisonii	52	-	-	11.7	12.1	-	33.2	-

Tables 4a and 4b shows that the ecological dominance of *N.fruticans* on the habitats which they occur is mostly due to the large cover of Nypa fronds which does not allow the mangroves to compete efficiently and therefore dwindle in importance. Nypa clearly shows dominance on the distributary channel and wooded levee in both the overstorey and understorey. Nypa is responsible for the dwindling mangrove structure and the species may soon dominate all the fluvial physiographic landforms east of the Niger Delta (Ukpong, 1992a).

Once established, *Nypa fruticans* initiates a change in the physical and chemical nature of the soils or tidal mud. The rhizomatous/fibrous roots of the palms being an extensive mat cause the soft mud to become more resistant in structure. Soft tidy mud is usually slippery and almost fluid mass such that mangrove propagules are embedded vertically in it while growing. With growth, the soil becomes sticky and plastic with high proportion of root content and relatively hard in structure. Although mangrove progagules are found on Nypa soils they often lie horizontally and not vertically embedded, which retard their germination and propagation in Nypa groves (Ukpong 1995b).

Table 5: Characteristics of soils under Nypa and other mangrove species

Species	Nypa		Rhizophera		Avicennia	
Sample depth (cm)	0-20	20-40	0-20	20-40	0-20	20-40
Parameter						
Bulk density (gcm^{-3})	1.73	1.73	0.89	0.89	1.09	1.06
Field moisture (%)	135.5	138.5	114.4	118.6	116.4	114.5
Sand	29.0	29.0	28.0	32.0	46.0	44.0
Silt	59.0	63.0	52.0	44.0	30.0	30.0
Clay	12.0	8.0	20.0	44.0	24.0	26.0
Texture	silt loam	silt loam	silt loam	loam	loam	loam
PH (field most)	6.3	6.4	5.6	5.8	6.8	6.9
PH (air dry)	5.3	5.5	4.9	4.8	6.2	6.4
Fibrous root %	103	8.2	7.8	7.3	4.3	3.8
Exchange acidity (cmol/kg^{-1})	3.2	4.7	4.7	3.4	0.8	1.2
Al (cmol/kg^{-1})	0.26	0.24	0.2	0.28	0.18	0.16
So_4 (cmol/kg^{-1})	0.18	0.17	0.18	0.17	0.09	0.09
Salinity %	2.8	2.7	3.5	3.4	3.4	3.2
org. carbon %	6.6	5.2	3.7	3.6	7.2	6.4
CEC (cmol/kg^{-1})	37.4	41.8	29.8	34.6	44.6	48.2
Ca (cmol/kg^{-1})	16.8	16.2	8.8	10.6	19.3	21.3
Mg (cmol/kg^{-1})	15.2	18.5	13.7	18.2	15.1	16.3
K (cmol/kg^{-1})	0.21	0.34	0.11	0.14	0.36	0.38
Na (cmol/kg^{-1})	2.2	1.9	3.4	2.6	8.6	9.4
P (cmol/kg^{-1})	1.8	1.4	1.1	0.8	2.3	2.0

compared with soils under mangrove species, Nypa soils have higher bulk densities (Table 5) (Ukpong 1995a), which impair penetration of the soil by roots, thereby limiting propogation to the rhizomes of the Nypa while other species are excluded. While the soil texture in Nypa groves is dominantly silt-loam others vary from silt-loam to loam. Silt loam is heavy and if empoldered (or exposed during low tide) tend to dry up faster and becomes hard. It appears that the effect of Nypa on tidal soils is mainly reflected on the physical characteristics of the soils. That is, Nypa modifies the mangrove habitat, making it less suitable for mangroves and more suitable for itself.

The Place of Nypa in Mangrove Vegetation Succession

Although Nypa is not a native in Nigeria it has become the determinant of successional sequence in the estuaries of the Niger Delta. Primary succession occur when Nypa seedling invade and establish on mudflats that have never before habited mangrove. It is perhaps important to distinguish between mudflats and tidal flats. Mudflats have been raised by sedimentation above mean low water tides while tidalflats are exposed by tides lower than mean low water. Following primary succession, only pure groves of Nypa stands would emerge. Since mudflats generally front elevated levees, the direction of Nypa spread is often towards the channel. Secondary succession occur when the primary mangrove species e.g. *Rhizophona racemosa*, *R. mangle* and *R. harrisonii* have been remove by human activity, particularly harvesting of the tree for fuelwood or construction. As the mangrove saplings and the Nypa eventually dominates the secondary succession and takes over the former mangrove habitat. In this way Nypa becomes ecologically more important, and has achieved dominance due to the low taxonomic diversity of the mangrove swamps and also species ability to deal with continually changing salinities (Ukpong 1991, 1997)

THE DYNAMIC THREAT OF NYPA

The nypa palm establishes very fast. It probably secrets chemicals which are lethal and inhibitory to other plants (Ukoima 1998). This aspect of accelopathy in nypa should however be investigated through research. Nypa spread is enhanced by the floating ability of the fruit and viability in the water over a long period of time. The seeds germinate in water while on transit to any readily available substrate to grow. They outgrow and crows-out other plants growing in their colonies. Hence they have displaced mangrove species through this very successful seed dispersal method. It has an additional advantage for rapid colonization through the formation of rhizomes.

The northern limit of the spread along the estuarine systems seems to be the limit of brackish water, although occurrences have been observed where the water is nearly fresh (Ukpong 1995a). Since the limit of he brackish water is determined by tide, the limit may be considerably spread inland. The spread of nupa to the brackish/freshwater interface poses threat to such non-mangrove plnts like *Pandanus spp* and *Elaeis sp* which dominate in the associated ecosystems. The southern limit of the palm is apparently determined by increasing salinity level in the soil and water. Along the Atlantic coastal beachridge, nypa growth is scrubby due to low freshwater inputs but nevertheless has displaced the native mangroves and associated species e.g. *Phoenix reclinata* and *Acrostichum* on the landward edge of the beachridges.

The following coastal vegetation belt formations are usually identified:

(i) Only mangrove (*Rhizophora racemosa, R. mangle, Avicennia africana* or a mixed community of these species).

(i) Mangrove with nypa palm in front

(iii) Nypa palm in front and middle, mangrove behind

(iv) Mangrove and other trees, *(P. reclinata, Conocarpus etc)*, no nypa
(v) Young mangrove in front, nypa in the middle, mangrove, nypa and other tree.
(vi) Mixed forest with *Pandanus*, no nypa

This banded structure of the vegetation associated with nypa extends up to latitude 5°09'N in the Calabar river estuary. Commonly, mangrove occurs behind fringing nypa palm. However, at certain portions of the coastline, nypa has spread beyond the fringes, particularly near settlements (including urban areas) where exploitation pressure on the mangrove is high.

The spread of nypa is encountered by natural factors such as tidal currents which transport nypa seedlings to coasts and shores, and deposit them on the mudflats and tidal plains. Anthropogenic activities also facilitate the spread of nypa. Where mangrove is felled by man, nypa palm quickly colonizes the area and with its thick unshed leaves, prevents mangrove regeneration. Once nypa colonizes an environment, it becomes so dense that light penetration is inhibited, such that the light-demanding mangrove seedling would find difficult to grow. Also the dense leaves prevent the viviparous seedling of mangroves from gaining access to the soil. Hence nypa palm prevents any undergrowth, thereby making it easy for wave erosion of the coastline. Moreover, since nypa palm lacks the root-dam system of mangroves, which serve as natural sea defences, coastal erosion will escalate, especially, with the global rising temperature and consequent melting of ice in the Antartic (Holzlohner and Nwosu 1997).

IUCN/UNEP/WWF (1991) cautions the introduction of nypa palm (a non-native) species since it threatens the productivity and diversity of the ecosystem. Nypa palm lacks leaf-fell system with which the mangrove manures the surface waters and increase productivity. Nypa is a destroyer of mangrove ecosystem.

Nypa has negative effect on aquatic life because it does not create conducive ground for spawning and breeding as compared to the indigenous *Rhizophora*. The morphological characteristics of Nypa creates obstacles to the free movement of fishes and land animals. The rhizonmatous character of the palm produces impenetrable entanglements anywhere the palm grows in large numbers. Although Nypa forms this juxtaposing entanglement by way of producing rhyzomes, the palm bases are usually clear, plain and without any debris which fishes can feed on, hide in and/or breed.

Comparatively in mangrove situations, sufficient debris and hiding places abound for the survival and breeding of fishes. Consequently, fisheries production is impeded and catches by the fisher folks are reduced. Hence, the preservation of the mangrove ecosystem is crucial for the viability of a large coastal and wetland fishers. The massive presence of Nypa palm has contributed to the migration of fauna resources to areas they cannot cope with physically and ecologically. The ultimate level of degradation is the disappearance or extinction of valuable species some of which are not even known to the scientific world. Mudskippers which used to be delightful delicacy in the coastal communities of the Niger Delta are presently difficult to come by even in the richest fishing camps.

On the mangrove forest, the effects of Nypa may be summarized as:

(a) Killing of all mangrove plants: The nypa palm establishes very fast and soon achieves dominance where it found. Allelopathy has been suggested as an inhibitory factor but this is unlikely in an ecosystem that is regularly flushed by tides. However allelopthy in nypa needs to be investigated.

(b) Reduction in the number of fishes in the adjoining coastal shelf and sea: Nypa fronds have a long life span and provide much less litter and organic debris for the spawning fishes, and shelled animals. The fishes changes spawning grounds or become extinct in the coastal waters.

(c) Extinction and endangering of other plants in the mangroves: Associated plant species e.g *Raphia hookeri* and *Drepanocarpus lunatus* which usually occur with mangroves on sandy substrates have disappeared with the encroachment of nypa. Nypa is stronger mono-specific.

(d) Migration of animals and birds from the mangrove zone: Since the mangrove ecosystem is hostile to man, it has been, so far a reservation for many endangered animal and bird species. These species utilized the mangrove branching for habitat while feeding on the numerous small fauna that habit the groundlayer and mangrove mud. With the Nypa invasion, habitat change has resulted in species loss or extinction.

The socio-economic effects of the Nypa invasion include:

(a) Economic hardship on fishermen since fishing is a means of livelihood in the mangrove ecology zone.
(b) Reduction in protein supply to the people of the Niger Delta area.
(c) Reduction in fulwood supply. The importance of mangroves as fuelwood cannot be overemphasisd
(d) Increasing unemployment for those who rely on mangrove ecosystem resources.

As at now, Nypa is an undesirable plant that is changing the natural equilibrium of the mangrove ecosystem. That thatching can be made from Nypa fronds is unquestionable but there are other easily accessible palms in the delta area used for thatch making. Although alcohol can be gotten from Nypa, sugarcane can be more conveniently cultivated in Nigeria without recourse to the hostile mangrove ecosystem.

Nypa palm colonization has resulted in shoreline retreat due to the destruction and displacement of mangrove germplasm. The palms were introduced supposedly to check marine erosion, instead the palms and their prostrate sub-horizontal stems appear not to be able to trap debris to build up the shore line as expected. Rather, displacement of mangrove tree by Nypa gives rise to sedimentation, to the extent that the creek and water channels are no longer navigable.

CAN THE NYPA THREAT BE CONTAINED?

When Nypa seedlings were introduced into the Niger Delta in 1096, nobody thought of the ecological consequences that would follow their arrival. Cases in point abound in other parts of the world whereby introduction of exotic species almost precipitated ecological disasters in such regions. For instance, the introduction of cactus into Australia almost ruined the agricultural future of the sub-continent.

Nigeria has the largest mangrove wetland in Africa with its rich floristic species and fauna population. However, a combination of factors such as anthropogenic and ecological have threatened to reduce the relevance of the mangrove wetland in the environmental and socio-economic schemes of Nigeria. It was man that opened the ecological flodgate for the invasion of the valuable wetlands by Nypa. In addition, the biological characteristics of mangroves have helped to encourage Nypa spread. For example the *Rhizonphora* species (*R.racemosa* and *R.harrisonii*) are very slow growing species and do not regenerate when cut down.

They have scanty foliage (though not deciduous), giving rise to low crown cover. With these characteristics, the species give room to Nypa palm to invade their habitats and overthrow them.

The displacement of indigenous plants by Nypa is therefore serious ecological threat to mangrove bio-diversity. It translates to a big loss to the nation in terms of fish production, coastal land and river bank protection, fuel wood extraction and other derivatives from the mangrove ecosystem. Hence, the loss of the mangrove ecosystem is a land resource degradation with adverse changes in ecology, soil decline in soil productivity, loss of germ plasm and gradual deterioration of the entire ecosystem.

Since the rapid displacement of the mangrove by Nypa has threatened the existence of the inhabitants of the coastal areas, then the starting point of containing the threat should be anthropogenic. The general opinion of the coastal inhabitants has been the palm is a nuisance. They will therefore support any action that would result in eliminating the palm from their environment.

A Holistic Approach: The holistic approach emphasis a comprehensive, integrated framework for policy planning and management. To this end the use of integrated coastal zone management (ICZM) is advocated for the eradication of Nypa palms threat and the regeneration of mangrove in the coastline. The concerns may be viewed in the order:

(i) Developing a sound institutional framework saddled with the job of mangrove ecosystem research and management.

(ii) Emphasis placed on Environmental planning and management.

(iii) Coordination of activities of the major educational and research institutions in the Delta area such that their relevant arms work together towards the common objective of Nypa eradication and mangrove ecosysytem preservation.

(iv) Stressing stakeholder participation in the management effort. The complexity of the coastal environment requires understanding of the concern and aspirations of the coastal inhabitants (Stakeholders) and need to be involved throughout the planning and implementation of the Nypa programme.

(The Holistic approach is sound and need to be reviewed for consideration. However, the Nypa problem cannot be solved overnight. It is, at the moment not even possible to dateline for the eradication of Nypa palms in the Niger Delta).

The Nigeria Conservation Foundation (NCF) project – Nypa Plams Control by Utilization – has three major components:

(i) Awareness and education on the threat of Nypa to the coastal ecosysytem.

(ii) Training, skill development and capacity building of local community to utilize Nypa in the production of demostic and commercial wares. eg. earring, necklaces, roofing mats, key holders, etc.

(iii) Ecological rehabilitation through a pilot programme involving replanting of mangrove seedlings in original Nypa invaded swamps.

The Nigerian Ministry of Environment is also promoting a concept of Nypa control. The approach is centered on removing Nypa palms and rehabilitating mangrove species. This and the NCF effort should be brought together and reviewed under the ICZM concept to develop both short-termed and long-term strategies fir Nypa eradication and mangrove ecosystem management in the Niger Delta.

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