

Survey, Biodiversity and Impacts of Economic Activities on Mangroves Ecosystem in Eastern Part of Lagos Lagoon, Nigeria.

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Abstract: Mangrove swamps in Nigeria stretch along the entire coast and are found in nine of the 36 states. The eastern part of Lagos Lagoon is dominated by red mangrove (*Rhizophora racemosa*) which might be as a result of the abundant of this mangrove species in Nigeria. Invertebrates and vertebrates are found at the bottom of the mangroves while some are found on the body of the mangroves. Molluscs like periwinkles (*Tympantonous fuscatus*) and *Pachymelaian aurita*) and oysters (*Crassostrea sp.*). Crustaceans like purple mangroves crab (*Goniopsis pelii*), African mud crab (*Panopeus africanus*) and Lagoon land crab (*cardiosoma armatum*). Fish fauna like tilapia (*Sarothernedon melanopterus*), Mudskipper (*Petriophthalmus Barbatum*) and larva stages of some important fishes and shrimps. Other vegetations are found along with the mangroves trees while some are found attached to the prop root or the pneumatophores e.g water hyacinth and water lettuces. Economic activities that surround Lagos Lagoon mangrove communities are Fishing, aquaculture (acadja), sand mining, dredging activities and logging. Mangrove trees are cut to make fire wood, construction of road and artificial pond and local medicine. Soils are mined for bridge, house and industry construction. The negative impact of these economic activities can lead to climate changes, changes in the upstream habitat, loss of habitats and biodiversity and pollution due to population growth and urban development.

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1. Introduction

Mangroves are salt-tolerant characteristic complex plant communities occurring in sheltered coast line areas in the tropical and sub-tropical intertidal regions of the world such as bays, estuaries, lagoons and creeks. The plant community of a mangrove swamp is most commonly termed mangal, a forest with a dense canopy, also known as mangrove swamp forest or, simply, mangrove. The mangrove forest of Nigeria is the largest in Africa and third largest in the world after India and Indonesia (Macintosh and Ashton, 2003). Nigeria contains the most extensive mangrove ecosystems, which comprise nearly 35 per cent of the total cover for West Africa (UNEP-WCWC, 2006b). The total mangroves covers in Nigeria is about 7 386 km² which is 22 percent in Africa (UNEP-WCWC, 2006b) Mangrove swamps in Nigeria stretch along the entire coast and are found in nine of the thirty six states. The largest extent of mangroves is found in the Niger Delta between the region of Benin River in the west and the Calabar, Rio del Rey estuary in the west. The lagoons of Lagos and Lekki dominate the coastal systems in the west. Both Lagoons are fringed by mangroves and backed by swamp forests (FAO, in press). Several threats like population growth and

economic development, petroleum and gas exploration and production, deforestation, invasive species and commercial fish farming are the major problems confronting mangrove ecosystem, This study is aimed to provide basic and current information on the state of mangrove ecosystem in Lagos Lagoon, and its key objectives are: (1) to Survey and identify mangrove areas in Lagos Lagoon; (2) to assess the types, abundance and distribution of mangrove species in Lagos Lagoon; (3) to identify mangrove associated fauna and flora in Lagos Lagoon; (4) to determine economic activities that is associated with mangrove ecosystem in Lagos Lagoon and their impact; and (5) to determine threats to mangrove ecosystem and the level of their destruction.

2. Methodology

Study Area

The Lagos Lagoon lying between longitude 6^o26'N and 6^o30'N and latitude 3^o25'E and 3^o36'E. On the available mangrove species, five stations were selected in eastern part of Lagos Lagoon for the purpose of this study; they are Badore, Langbasa, Agbeki (Mid lagoon), Bayeku and Oreta. Figure 1 presents the map of these stations on the lagoon in

Lagos State. Badore and Langbasa are close to each other in Eti-Osa LG). Oreta and Bayeku are closed each other and found at Ikorodu. The entire mangrove found in these areas are on the coastline and surrounded by communities expect Agbeki and Bayeku that are found on middle of Lagoon (Figure1).

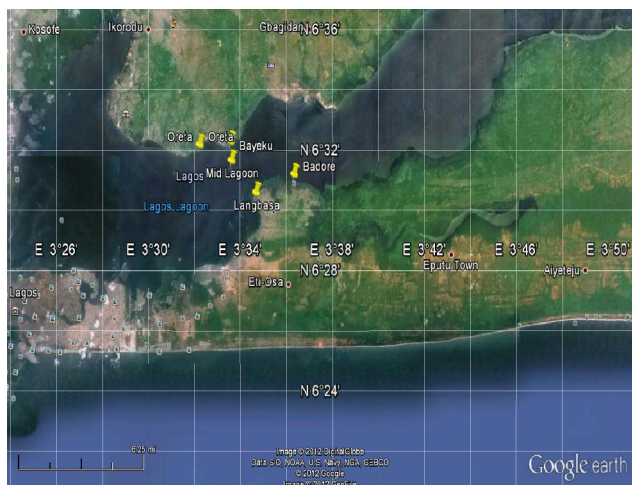


Figure 1: Satellite imagery map of eastern part of Lagos Lagoon showing the study sites

The Main Activities

- Global Positioning System (GPS) was used to determine the geographic and rectangular coordinates of each station (communities) on Lagos/Lekki Lagoon.
- Collection of water samples at each station for determination of Physico-chemical parameters.
- Collection of different mangroves plants at each station to determine their family and species.
- Visual/Direct observation was also included for determination of the followings:
 - Economic activities surrounding the areas.
 - Vegetations present along with the mangroves.
 - Closeness to community.
- Collection of mangrove fauna for identification.
- One-on-One communication with the villagers on the usefulness of the mangrove.

Biodiversity Identification

Both flora and fauna species were taken to the laboratory for proper identification and taxonomy. Mangrove species were classified and identified according to APG III taxonomy classification for mangrove species. Mangrove fauna

were identified using FAO guide (Schneider, 1990) while fish species were identified using Olaosebikan and Raji (Olaosebikan and Raji, 1998).

3. Results

Mangrove Diversity and Distribution in Eastern Part of Lagos Lagoons

The distribution of mangrove species in eastern part Lagos Lagoons is presented in table 1. All the stations had red mangrove (*Rhizophoraceae*) with the abundant of *Rhizophora racemosa*. White mangroves (*Laguncularia racemosa*) of the family Lambrataceae is also found along with red mangrove in Langbasa. *Nypa* palm (*Nypa fruticans*) is scantily present along this part of the Lagoon. Figures 2 and 3 present types of mangrove species found in Langbasa and Badore.

Table 1: Distribution of Mangrove Species in Eastern part of Lagos Lagoon (Bd, Badore; Lg, Langbasa; MI, Mid Lagoon; By, Bayeku; Or, Oreta).

Scientific name	Bd	Lg	MI	By	Or
<i>Avicennia germinans</i>				*	
<i>Rhizophora mangle</i>	*	*	*	*	*
<i>Rhizophora racemosa</i>	*	*	*	*	*
<i>Rhizophora harrisonii</i>	*	*	*	*	*
<i>Laguncularia racemosa</i>		*	*		*
<i>Conocarpus erectus</i>					
<i>Nypa fruticans</i>			*	*	*
<i>Acrostichum aureum</i>					

Physico-chemical parameters of the water samples

Physico-chemical parameters of the areas where mangrove are found in Lagos Lagoon are presented in Table 2. Water sample in Langbasa had highest salinity and conductivity of about 4.7⁰/00 and 8.67mS/cm respectively, compared to others stations. Most of these stations have water of little salt content. Dissolved oxygen ranged between 2 (Bayeku and Oreta) and 8 (Badore). Turbidity ranged between -4cm (Langbasa) and 9cm (Badore). Most of these stations were alkaline (pH > 7).

Biodiversity

Invertebrates and vertebrates were found at the bottom of the mangroves while some were on the body of the mangroves. Molluscs like periwinkles (*Tympantonous fuscatus* and *Pachymelaian aurita*)

and oysters (*Crassostrea sp.*). Crustaceans like purple mangroves crab (*Goniopsis pelii*) and Lagoon land crab (*cardiosoma armatum*). Fish fauna like tilapia (*Sarothernodon melanopterus*), Mudskipper (*Petriophthalmus Barbatum*) and larvae of some fishes. Table 3 showed fish species associated with these mangrove areas. In some areas, such as Badore and mid Lagos Lagoon other vegetations were found along with the mangroves trees e.g palm trees, water hyacinth and water lettuces.

Economic Activities surrounding eastern Lagos Lagoon Mangrove Communities

Fishing, aquaculture (acadja), sand mining, dredging activities and logging are the major economic activities along eastern part of Lagos Lagoon mangrove communities (Table 4). Mangrove trees are cut to make fire wood, construction of road, bridges, houses artificial pond and local medicine.



Figure 3: Red mangrove (*Rhizophora racemosa*) in Badore.

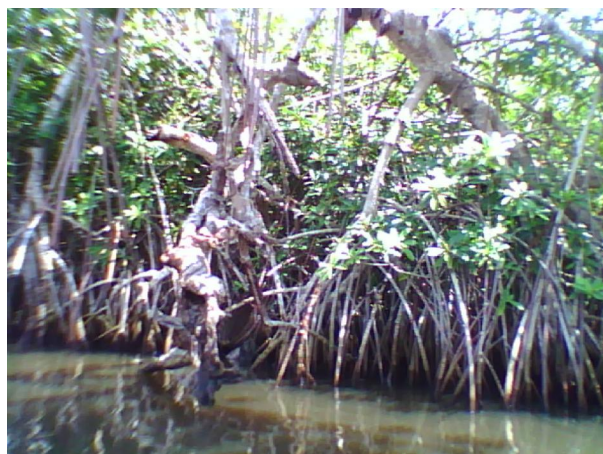


Figure 4: White mangrove (*Laguncularia racemosa*) in Langbasa

Table 2: Water chemistry of mangrove communities in Eastern part Lagos Lagoon (Bd, Badore; Lg, Langbasa; MI, Mid Lagoon; By, Bayeku; Or, Oreta).

Parameter	Bd	Lg	MI	By	Or
Water temperature O ⁰ C	32	31	30	29	28
Air temperature O ⁰ C	28	29	30	28	29
p ^H	8.22	8.51	8.57	8.67	8.75
Salinity (‰)	3.2	4.7	3.0	4.4	4.0
Conductivity (mS/cm)	6.05	8.67	5.69	8.09	7.53
Turbidity (cm)	9.0	-4.0	0.0	-7	-3.0
Dissolved oxygen(mg/l)	8	5	2	2	2
Total hardness	36	64	42	20	16

Table 3: Fish species found in Mangroves Communities in Eastern part of Lagos Lagoon (SN, Scientific name; CM, Common Name)

Family	SN	CM
	<i>Ethmalosa</i>	
Clupeidae	<i>fimbriata</i>	Bonga shad
	<i>Mugil</i>	
Mugilidae	<i>Cephalus chloroscombrus</i>	Atlantic bumper
Carangidae	<i>chrysurus</i>	bumper
	<i>Caranx</i>	Crevalle
Carangidae	<i>Hippo</i>	jack
	<i>Petriophthalmus</i>	
Gobidae	<i>barbatum</i>	Mudskipper
	<i>Lutjanus</i>	Red
Lutjanidae	<i>goreensis</i>	snapper
	<i>Hemichromis</i>	
Cichlidae	<i>fasciatus</i>	Tilapia
	<i>Oreochromis</i>	
Cichlidae	<i>niloticus</i>	Tilapia
	<i>Sarothernodon</i>	
Cichlidae	<i>melanotheron</i>	Tilapia
	<i>Chrysichthys</i>	
Bagridae	<i>nigrodigitatus</i>	Catfish

Table 4: Economic Activities surrounding Lagos and Lekki Lagoon Mangrove Community (Bd, Badore; Lg, Langbasa; ML, Mid Lagoon; By, Bayeku; Or, Oreta).

Activities	Bd	Lg	ML	By	Or
Fishing	*	*	*	*	*
Acadja	*	*	*		*
Sand minig	*	*	*	*	*
Dredging	*	*		*	
Logging	*	*	*	*	*
Agro forestry					
Water/Ship Port					
Oil Depot					
Hydroelectric project				*	*
Ecotourism					

4. Discussion

Eight true mangrove species are found in West Africa (Tomlinson, 1986). All of the eight mangrove species found in West African are found in Nigeria (UNEP-WCMC, 2007). Therefore, there is possibility for the eight mangrove species to be present in this Lagoon but many of these species has lost due to environmental hazards and economics activities. Eastern part of Lagos Lagoon is dominated by red mangrove (*Rhizophora racemose*) which might be as a result of the abundant of this mangrove species in Nigeria. The true mangrove species found in most Lagoon is red mangrove (*Rhizophora racemose*). Ohimain (2006b) reported that in the lagoons and deltas, *Rhizophora racemosa* is the dominant species. It is the pioneer at the edge of the alluvial salt swamp; *Rhizophora harrisonii* dominate in the middle zone and *Rhizophora mangle* are most common on the inner edge, while *Avicennia germinans* is mostly restricted to relatively higher salinity zones, especially at the river mounts opening into the ocean and mangrove forests adjacent to coastal beach ridges bordering the Atlantic Ocean. Salinities recorded along this part of the lagoon were as a result of lagoon with low salt content compared to marine environment with high salt contents. However the fact that many species grow well at low salinities indicates the beneficial effects of salt content on their growth. Commonly found along the mangrove substrates are crustaceans like periwinkle and oysters while the fish juveniles of most families like cichlidae, Gobidae and Mugilidae are also

present. The presences of the juvenile's stages of these fish species support that mangrove swamp is breeding ground for most fish species. Ibe and Awosika (1991) reported that mangroves are very important ecologically because they provide spawning and nursery grounds for many coastal fish species. They also serve as the habitats for some of the crustaceans and molluscs. West African mangroves are also remarkable for supporting some indo-Pacific lineages of fish in the Atlantic Basin, such as the mudskipper (Kaufman, n. d). Mangrove ecosystems support industrial and subsistence activities in Nigeria, and are critical for food security for many living in abject poverty in the coastal zone. Great amount of mangrove species in Lagos State are lost to urbanization, industrialization and agriculture. While fragmentation itself does not greatly affect mangrove biodiversity, of greater concern is the total amount of mangrove area lost to urbanization, industrialization and agriculture, as well as impacts from timber and petroleum exploitation (Diop, 1993). Disposal of municipal solid wastes into the waterways is threatening the peri-urban mangroves in eastern part of Lagos Lagoon. Non-biodegradable wastes, particularly plastic and nylons that are carried into the mangroves during high tides are often stranded on the mangrove pneumatophores as the tide recedes (Omhimain, 2006b). Some mangrove loss has occurred as a result of coastal erosion and deforestation for commercial timber trade and subsistence-level use of wood products such as fuel wood, fish processing and construction timber. Greater amount of mangrove are lost due to industrialization and urbanization because many of these mangrove communities are sand filled and cleared for residential and commercial purposes. Key economically exploited resources in the mangrove regions of this Lagoon are fishing, aquaculture (acadja), sand mining, dredging activities and logging. Commercial exploitation of wood for poles, pulp and paper in 1988 was estimated at 10 to 750 million cubic meters (Macintosh and Ashton, 2003). At a subsistence level, mangrove wood is used for fish stakes, fish traps, boat building, boat paddles, yam stakes, fencing, carvings, building timber and fuel (Carrere, 2002).

Conclusion

In summary, mangrove ecosystem in Lagos Lagoon is degrading due to the negative impact of economic activities around this lagoon. It is therefore necessary to develop a conservation and management measure to rehabilitate the deforestation areas.

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