Biodiversity Assessment of **Finima Nature Park (FNP)** Bonny Island, Rivers State, Nigeria

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Nigeria LNG Limited

NIGERIAN CONSERVATION FOUNDATION

For nature...for people...for Nigeria

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Preface

For NLNG

Executive Summary

Nigerian Conservation Foundation the technical manager of Finima Nature Park conducted a rapid biodiversity assessment of the Park between April and July 2019 to document its biological diversity. The following studies were conducted with regards to the underlisted components:

- Wildlife and Mammals
- Ornithology
- Herpetology
- Vegetation and Plant Diversity
- Carbon Stock and Ecosystem Service Assessment

The Rapid Biodiversity Assessment of Finima Nature Park (FNP) was conducted within 4 days except for Carbon Stock and Ecosystem Service assessment which extended for an additional 4 days. The Assessment team involved subject area expert consultants, NCF team comprising of Technical Programme and FNP project Staff. Several methods and approaches were adopted involving direct observation, literature review, interviews, and reliance on local knowledge of the area.

A total of 840 individual birds across 80 species were recorded involving migratory and resident waterbirds, forest birds, and waders. The record of other wildlife in the Park include 17 mammals, 36 reptiles and 18 amphibians among which are endemic species to the Niger Delta environ.

The vegetation of FNP are mostly made of woody plant and a total of 42 plants species were recorded including a mix of primary and secondary forest. The richness of these tree species has contributed to the Park's ability to store carbon totaling 247,158.78 mg t CO_{2e} .

The current management approach of Finima Nature Park has contributed to the richness in biological diversity of the Park and this is encouraging as this site is one of the only remaining representative freshwater forest in the Niger Delta.

As the Park look forward to institutionalization, there is a very high chance of its designation as a Ramsar Site of International Importance by Ramsar International and a Key Biodiversity Area recognized by BirdLife International.

At the State level, Finima Nature Park has been approved and certified by the Ministry of Culture and Tourism, River State as an Ecotourism hotsport in the State.

This assessment was funded by Nigerian Liquefied Natural Gas Ltd the sponsor of Finima Nature Park

Wildlife and Mammals

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1.0 Introduction

Bonny is one of the barrier islands that line the eastern flank of Nigeria's Niger Delta coastline. Its ecology is largely defined by Bonny River estuary to west, Bonny Creek to the north, Andoni River to the east and the Atlantic Ocean to the south. It is home to the FNP. Covering about 1,000 ha, the FNP was established in 2001 through a consensual initiative of the Nigerian Liquefied Natural Gas (NLNG) company and its host community (Finima), with a key objective of protecting and enhancing the preservation of the ecological integrity of the area. The FNP comprises an area of mix of mesic-land, freshwater swamp-forests near a large brackish river-mouth, and a network of rivulets in the low-lying central southern coastline of Nigeria. The interspersion and juxtaposition of these habitats accounts for the rich flora and fauna of the island, which historically included some megafauna such as the salt-water Hippopotamus *Hippopotamus amphibious*. The FNP is ecologically a miniature mimic of the larger Bonny Island. This exercise is at the instance of the NCF – NLNG partnership and has a principal objective of producing a comprehensive compendium of mammalian species that have been recorded in the island and its associated aquatic habitats in recent times. It also aims to outline a few other aspects of FNP's synecology and natural history that were observed and recorded during this exploratory study visit to the park.

2.0 Methods Employed in this FNP Mammal Study

Three key methods were employed in this exercise:

i) A review of available published and unpublished literature and documents on the biodiversity of Bonny Island, with a focus on the mammalian fauna. This included documented reports and photographs from the consultant's recent study visits to the FNP and other parts of Bonny (e.g., Ezealor, 2011, 2013; Abere and Lateef, 2015).

ii) Guided exploratory walks along major trails of the FNP, including parts of the elevated board walkways that traverse the eastern sector of the Park. Park Rangers were specifically requested to take the consultant to parts of the park with noticeably high activity of wildlife, especially the mammals. During these investigative walks, observed phenomena of biodiversity interest were recorded in a field notebook, and where and whenever possible, photographed with a Canon EOS 2000D© camera. A RSPB-brand 8X40 pair of binoculars was used to visualize distant animals of interest, for proper identification. Specifically, for digital evidence of nocturnal mammals, a mist net and an 8 Mega Pixel Digital Scouting Camera were deployed at strategic locations in the forest. Furthermore, pitfall traps were deployed to catch terrestrial small mammals (Plate 2). These activities were specifically undertaken to counter or confirm results of some earlier reports, which appear to suggest or insinuate the absence of terrestrial and aerial small mammals from the FNP.

Plate 2. A pitfall trap set at the edge of a swamp forest. This trap caught a Shrew the first night, and a rodent the second night. (**Photo credit:** A.U. Ezealor).

iii) To augment the above field-based activities, an informal interview time was spent with an ex-hunter octogenarian member of the Finima Community (Chief Festus Brown), to gain from him some historical knowledge of changes that may have occurred in the composition of the mammalian fauna of Bonny, particularly the FNP. Now a converted nature-lover, Chief Brown gave a pitiful account of the decline of animal diversity and numbers in Bonny. He mentioned some animals he used to encounter in the island, which are no longer available, or are now hardly seen.

3.0 Results and Discussion

A. *Mammals*

On the basis of this study, Table 1 and the related Plates 3-12 encapsulate the mammals of the FNP and its adjoining continental shelf and other associated habitats in a provisional checklist. It can be deduced that at least 17 mammalian species have been historically recorded in the FNP and environs. This includes the aforementioned salt-water Hippopotamus, which was locally exterminated from the area in the recent past. However, some mammalian species (e.g., the Mona Monkey) have thrived since the establishment the FNP and may in the foreseeable future (if not properly managed) potentially attain pest status in residential areas in the island.

B. *Other Vertebrate Wildlife of the FNP*

Birds, a common and very visible vertebrate taxon were encountered incidentally in and around the FNP during the survey. The birdlife of the park is very diverse, and some species especially of the Waterbird guild are not uncommon. As with the other barrier islands of the Nigeria's Atlantic coastline, Bonny (and by implication the FNP) plays a vital role in the winter and spring migrations of Palearctic migrant birds that visit west central and southern Africa.

The FNP is also blessed with a stimulating herpetofauna (Amphibians and Reptiles). Abere and Lateef (2015) recorded 6 amphibian and 17 reptilian species in a wildlife survey of the island, although the identification of one of the listed amphibian species ("*Gigantorina goliath* - Goliath Frog" *sic*) is doubtful and very questionable. That study also did not record a herpetofauna which is a herpetologist's delight (the African Fire Skink *Lepidothyris fernandi*). A dead specimen of this very picturesque species was recovered during this study (Plate 13). A forest Gecko was also caught with the pit –fall trap (Plate 13b). A variant of the Nile Monitor *Varanus ornatus*, some Crocodiles *Crocodylus* sp. and Turtles (Chelonids) reportedly taken from and around the FNP in the past, are also being kept as pets by some households in Bonny (Plates 14 and 15).

C. *Invertebrate Life*

The richness of invertebrate life in the FNP and its adjoining habitats is obvious even to the most casual of observers. One is immediately attracted to the beauty of a variety of Lepidoptera as they flutter by in search of flowers. Next to vertebrate-wildlife-based mini safaris which the park currently conducts, properly organised butterfly-watching may offer exciting out-door recreational experiences for visitors to the FNP.

Table 1. Indicative Explanation of Mammalian Fauna of the Finima Nature Park (FNP), Bonny, Rivers State.

Key to Probable Species Abundance and Status in the FNP

Br for a species known to be breeding in the FNP.

Br? for a species that is suspected to be breeding in the FNP due to observed courtship displays and/or reported sighting of juveniles.

A = Abundant; the species occurs in large numbers, and will usually be encountered by every visitor to the FNP.

C = Common; for a species with a high probability of being encountered by most visitors to the FNP.

U = Uncommon; for a species that requires a significant search effort to catch sight of, in the FNP.

S = Scarce; for a species that is usually encountered very infrequently in the FNP.

R = Rare; for a species that is known chiefly from previous records, or previously recorded or known to local residents of the island, but not encountered in this study or recent surveys.

I or **II** for a species which is in Schedule I or Schedule II respectively, of Nigeria's Endangered Species (Decree) Act 11 of 1975.

? … A question mark before a species indicates doubt or some reservation over record of the species in the FNP.

√√ indicates evidence for presence of a species in the FNP or its immediate environs.

1°- for species sighted, trapped, and faecal and footprints

2°- species referenced in existing literature review

3°- Forest Guard and Local historical accounts or experience

COMMON NAME	LOCAL NAME /PIDGIN	*SCIENTIFIC NAME*	EVIDENCE/MEANS OF IDENTIFICATION			PREFERRED HABITAT	LOCAL ABUN-DANCE AND STATUS
			1°	2°	3°		
Mammalia: Mammals							
Order: Cetartiodactyla; Infraorder: Cetacea; Family: Balaenopteridae (Whales) ***Most Whale species are protected throughout the world by International Conventions.***							
1.	**Humpback Whale**	*Megaptera novaeangliae*			√√	Ocean	**U**. Some remains of this species have been recovered from the Bonny shoreline.
Primates (1sp): Apes, Monkeys, Prosimians, Galagos. ***All primates are protected under Schedule I of Nigeria's Endangered Species Act.***							
2.	**Mona Monkey**	*Cercopithecus mona*	√√	√√	√√	Forests	**C.** Several records of individuals and troops in the FNP were encountered during this survey.
3.	**Galago species; most probably Thomas's Galago**	***Galagoides thomasi***	**Forest Guards claimed to have seen the eyes reflecting light at night, when**			**Low and mid forest canopy.**	**S. Occasionally encountered by Forest Guards**

		illuminated by a flashlight.			
Chiroptera: Bats					
4. Fruit Bat species	**Suborder:** Megachiroptera		√√	Ubiquitous; frequents fruiting trees at night.	**C.** Probably common, but not often seen or encountered due to nocturnal habits of the group.
5. Insectivorous Bat species	**Suborder:** Microchiroptera		√√	Human-made shelters.	
Soricidae: Shrews					
6. Climbing Shrew	*Sylvisorex* sp.	√√		Trapped at a swamp forest edge	**C.** Probably common but its secretive habit makes the species less visible.
Muridae: Rats and Mice					
7. Bush Rat (Plate 9)	*Aethomys* sp	√√		Degraded secondary forest	C.
8. Black Rat	*Rattus rattus*		√√	Commensal in human habitation. Potential pest.	C. Common but not often encountered because of nocturnal habit.
9. House Mouse	Most probably *Mus musculus*	3°			U;

Gliridae: Dormice				
10. ?? Dormice sp.	*Gaphiurus* sp.	2º and 3º		**U** - Probably Uncommon
Carnivora: Carnivores				
11. African Clawless Otter	*Aonyx capensis*			U
12. Spot-necked Otter	*Lutra macullicollis*			U
13. Blotched Genet	*Genetta tigrina*	√√ A Forest Guard claimed to have seen this species in vegetation along the first board walkway. Also reported by Noutcha *et al* (2016) from else in the Niger Delta.	Low and mid forest canopy.	Probably <u>not</u> uncommon, but not often seen due to its nocturnal habit.
14. African Civet (Plate 10)	*Civettictis civetta*	√√ Scat/i.e., faeces, was photographed along a trail.	Swamp forest	Probably not uncommon, but not often seen due to its nocturnal and elusive habit.
15. African Palm Civet	*Nandina binotata*	√√ A Forest Guard claimed to have seen this species in vegetation along the first	Palm-rich forest, but it has a very catholic diet.	Similar to the species above.

		board walkway. Also reported by Noutcha *et al* (2016) from else in the Niger Delta.		
Hyracoidea: Hyraxes				
16. Tree Hyrax	*Dendrohyrax dorsalis*	√√ Both Park patrol staff and local people report hearing the characteristic very loud night calls of the species.	Forest	Probably <u>not</u> uncommon
Ungulata: Ungulates				
17. Water Chevrotain	*Hyemoschus aquaticus*	Reported by: Blench and Dendo (2007).	Probably swamp forest	R
18. Blue Duiker (Plate 11)	*Cephalophus monticola*	Occasional sightings; e.g., by a Game Guard (Inyang) in 2009.	Swamp forest	R
19. Sitatunga (Plate 12)	*Tragellaphus spekei*	√√	Swamp forest	S

A Summarized Checklist of Mammals in FNP indicating Endemism

S/N	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	HABITAT TYPE	ABUNDANCE
1.	Mona Monkey	*Cercopithecus mona*	LC	All Habitats	**+++**
2.	Red flanked duiker	*Cephalophus rufulatus*	Rare	All Habitats	**+**
3.	Blue duiker	*Cephalophis monticola*	Threatened	All Habitats	**+**
4.	Common bush buck	*Tragelapus scriptus*	Threatened	Forest	**+**
5.	Sitatunga	*Tragelapus spekei*	Endangered	Forest	**+**
6.	Tree pangolin	*Manis tricuspis*	Critically endangered	Forest	**+**
7.	Porcupine	*Atherurus africanus*	Rare	All Habitats	**+++**
8.	Gambian giant rat	*Cricetomys gambianus*	Common	All Habitats	**++++**
9.	Ground squirrel	*Xerus erythropus*	Common	All Habitats	**++++**
10.	Red footed squirrel	*Hepiosciurus rutobrachium*	Rare	Forest	**++**
11.	Flying squirrel	*Anomalurus sp*	Rare	Forest	**+**
12.	Common otter	*Aonyx sp*	Rare	Riparian Forest	**+**
13.	Forest Genet	*Genetta poensis*	Rare	Forest	**++**
14.	Agwantibo	*Artocebus calabarensis*	Endangered	All habitats	**+**
15.	Gallago	*Galago spp*	Endangered	Forest	**+**
16.	Two-spotted palm civet	*Nandinia binotata*	Rare	Forest	**+**
17.	Grasscutter	*Thryonomis swinderianus*	Least concern	All habitats	**++++**
18.	African civet	*Civettictis civetta*	Rare	All habitats	**+**
19.	Mongoose	*Crossarchus spp*	Least concern	All habitats	**++++**
20.	Shrew rat**	*Crocidura nigeriensis*	Endangered	All habitats	**+**
21.	**STRIPPED GRASS MOUSE**	***LEMNISCOMYS SPP***	**RARE**	**SUBURBIA**	**+**

*Animals which workers described but were no other evidence/s found
** Endemic to Nigeria

+ Abundance level (1 -5) lowest = 1 and 5 = Highest

3.1 Highlights of the Survey

- The following are some of the highpoints of observations recorded during the study, regarding the mammals and other wildlife of the FNP:
    - The most visible mammalian fauna of the park is the **Mona Monkey.** Both FNP staff and local residents attest to a **noticeable increase in the population size of this species** since the establishment of the FNP.

    - A vehicle-killed African Fire Skink picked up on one of the Park's access roads highlights **the problem of increasing human presence and activities** to the wellbeing of the island's biodiversity. Conversely, it also points to the role of the Park as a veritable vehicle for ensuring sustainable conservation of representative subset of the island's biodiversity.

    - Although it has never really been in doubt, the study confirmed the **existence of small mammals (Shrews and Rodents)** in the park, thereby increasing the biodiversity significance of Bonny.

    - An emerging serious problem that threatens the wellbeing of mammals and other wildlife of the park is the **increasing introduction of plastics into the Park.** Although this study did not directly record any of the known consequences of plastic pollution on mammals or other wildlife of the park, many of the repercussions (e.g., poisoning and reproductive failure), there have been reported cases of occasional dead specimens of birds or other vertebrates along the beach.

    - Unconnected with animal well-being, the consultant also observed some cases of poor/incorrect labelling of biodiversity in the Park. For example, a hole caused by fungal rot in a "wildlife-tree" trunk was inappropriately labelled as "burrow pit" **(Plate 16),** a term that is technically incorrect or non-existent in wildlife parlance!

4.0 Towards Remediation of the Problems that Mammals and other Wildlife now Face or May Face in the Future, in the FNP and Environs

i) ***Enrichment planting of wild fruit trees in the FNP forests.***

This will help to reduce the tendency of the Mona monkeys to enter areas of human habitation in search of food. Animal feeding centres may also be created in the forests, where favorite feeds of perceived

nuisance animals will be placed, to habituate them to finding and satisfying all their food needs in the forest habitats of the park.

ii) ***Proper disposal of household kitchen wastes in animal-tamper-proof waste bins.***

Concurrent with the wildlife habitat improvement recommended above, people living close to the park should be made to adhere to good sanitation practices, by plugging sources of cheap human leftover food, thereby deterring the interest of monkeys and other wildlife in human-inhabited areas. This in turn will reduce incidences of the emerging problem of wildlife-human conflicts in the residential areas of the NLNG and other areas of human habitations.

iii) There is a need to compile a pictorial pocket Field Guide to the Biodiversity of Bonny. This will help create awareness of the island's rich biodiversity and engender interest in its conservation. The NCF has knowhow and expertise to deliver on such an enterprise.

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Plate 3. A near-complete skeleton of a Humpback Whale[1] *Megaptera novaeangliae* recovered along the Bonny shoreline is on display in the FNP museum. (Compare with the size of adult human standing by the skeleton, and holding one of the ribs of the whale). According to *https://en.wikipedia.org/wiki/Humpback_whale#Range_and_habitat* (undated), some Whale species migrate to the Gulf of Guinea, which is a major feature of the southern border of the Finima Nature Park. The conservation education value of this specimen is tremendous. **(Photo credit: A.U. Ezealor)**

[1] Social media was recently replete with video recordings of a whale that was being butchered by local people after beaching at Brass, one of Nigeria's barrier islands to the west of Bonny. In 2017 there was also a report of a similar slaughter of a Cetacea at a beach in Akwa Ibom State, to the east of Bonny. These uncouth anti-conservation actions point to the need for a Nigerian national conservation strategy for cetaceans that visit our coastal waters. **Nigeria needs a marine national park!!!**

Plate 4. Skull of a Mona Monkey *Cercopithecus mona* on display in the museum.

(**Photo credit:** A.U. Ezealor)

Plate 5. The lower part of the hind limb of a Mona Monkey *Cercopithecus mona* on display in the FNP museum.

(**Photo credit:** A.U. Ezealor)

A

B

Plate 6. Food residues spat out by Fruit Bats (Megachiroptera) were found under overhanging branches of trees along trails in the FNP. **(Photo credit:** A.U. Ezealor**)**

Plate 7 An insectivorous bat (probably a Free-tailed Bat *Tadarida* sp) in a rest-hut along one of the trails. Evidence both Megachiroptera and Microchiroptera abound in the park, and both Park Guards and the local people have seen occasional bat roosts in various parts of the island. **(Photo credit:** A.U. Ezealor**)**

Plate 8. A Climbing Shrew (probably *Sylvisorex* sp) was trapped at a swamp forest edge at one of the patrol beats. **(Photo credit:** A.U. Ezealor**)**

Plate 9. A Rat (most likely the Bush Rat *Aethomys* sp) caught with a Pit-fall trap at the edge of a forest swamp in the FNP. **(Photo credits: A.U. Ezealor)**

A

B

Plate 10. A) The scat of an African Civet *Civettictis civetta* along a FNP trail. Notice the presence of both plant (seeds) and animal (hairs) in the faeces, pointing to the omnivorous food habit of the species. B) Footprints of the African Civet along the same trail. (Photo credits: A.U. Ezealor)

Plate 11. Footprint of an antelope along one of the trails; most probably, it is that of a Sitatunga *Tragelaphus spekei*.

A)  B) 

Plate 12. Browse marks of ungulates (probably Blue Duiker or Sitatunga) on **A)** *Cyrtosperma* and **B)** *Alchornea*. The height of the browse mark and footprints (if available) are often used to ascertain what animal had grazed or browsed a plant. **(Photo credits: A.U. Ezealor)**

Plate 13a. A) An African Fire Skink *Lepidothyris fernandi* killed by a vehicle on a FNP access road. This forest floor resident usually inhabits leaf litter in the FNP forests, and sometimes burrows into the soil. Its movement is snake-like, but the species is not poisonous as wrongly thought by many people. One of FNP's patrol wardens observed that he no longer encounters the species as often as he used to while on patrol in the past, implying a declining local population. (**Photo:** A.U. Ezealor); and a photograph of a live specimen. **(Source:** https://www.pinterest.com/pin/513551163737541037/**)**

Plate 13b. A forest gecko (Geckonidae) caught in one of the pit-fall traps. **(Photo credit: A.U. Ezealor)**

Plate 14. A caged Ornate Monitor *Varanus ornatus* (a variant of the Nile Monitor *Varanus niloticus*), kept as a pet by a local resident of Bonny. This species is a common resident of the park area.

Plate 15. Caged Crocodiles and Turtles kept as pet by a local resident of Bonny. These were taken from the FNP and environs in the past.

Plate 16. “The hole at the base of this tree is inhabited by a snake. Such holes may develop as a result of tree diseases caused by fungi or other plant disease agents.”. (Photo credits: A.U. Ezealor)

Plate 17. Parts of some trails become flooded during the wet season, and are rendered inaccessible to many visitors except to Rangers, and perhaps very hardy adult tourists. This begs a need for intermittent raised boardwalks, to make all parts of the Park visitor-friendly during all seasons of the year. The "bush umbrella" used by the consultant was made from large leaves of *Cytospermum* sp., a common plant of the FNP. **(Photo credits: A.U. Ezealor)**

Herpetology – Reptiles and Amphibians (Herps)

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1.0 Introduction:

Nigerian Conservation Foundation (NCF) embarked upon a rapid biodiversity assessment of the Finima Nature Park (FNP) to document the biological resources occurring therein.

FNP is a freshwater swamp forest lying along Nigeria's southern coastal area of Bonny Island, Rivers State. FNP is divided into the Eastern and Western blocks. The park is set aside for conservation and recreation; ecotourism and research on the flora, fauna and cultural heritage of Bonny Island. The Park boasts of a rich collection of wildlife some of which are endangered.

The Park covers a land area of approximately 1000 hectares, with a core area of about 700 hectares and buffer zone of about 300 hectares.

Banked at the south by the Atlantic Ocean, FNP is an important Nature Park and an interesting ecotourism destination.

1.1 Survey component:

Herpetology Study

The survey was limited strictly to the above listed taxa for the present scope of work as shown below

1.2 Project Scope and HSE Expectations

The HSE expectations as highlighted during the kick off meeting held with FNP Representatives from HSE department focused on the safest and best practicable options that can be deployed in order to survey or enumerate the wildlife species observed and identified in FNP and environs, following the right set of procedures in order to ensure that the Company's policy as well as Regulatory requirements on wildlife management/surveys are adhered to.

The project scope included but not limited to the following;

- Interview / dialogue with Personnel: Key personnel working in the area of concern who have had encounter with the mammals and Herps were interviewed in order to aid definitive identification of these groups of wildlife

- Field Surveys: This included the assessment of the wildlife activity patterns, areas of concentration, species involved, population estimates, etc., in order to determine their ranging and foregoing ecology, note their dens, spoors, potential point of salt licks and factors affecting them.
- Use of standard/modern scientific equipment/tools in combination with the use of intraocular assessment methods for evaluating wildlife population density, diversity and abundance at various times of the day and at various localities of the study area

2.0 LITERATURE REVIEW

2.1 General

Mammals and Herps are the variety of vertebrates in all their forms, levels, age and sex classes, including their diversity, species diversity, and genetics diversity (IUCN, UNEP and WWF, 1991). It is the totality of species resident in the given ecosystems or a region. The life forms include the different animals. Hereby birds are not part of the current study.

Total number of species in a given determined area “Species richness”

(3) Wildlife diversity**:** This encompasses diversity at a higher level of At this level the indicator of diversity is species dominance. Thus, wildlife biodiversity in the present study includes all the mammals and Herps of the region at various levels of biological organization (Egwali, *et al*; 2005, Eniang *et al*, 2003 and Olajide and Eniang, 2000). Wildlife Biodiversity provides ecosystem services which include the maintenance of the terrestrial and aquatic composition of the ecosystem, control and generation/ maintenance of soils, waste disposal, nutrient cycling, and pest control.

The loss of wildlife biodiversity as a result of environmental changes is an issue which is much discussed globally (Heywood& Watson 1995; Boyle & Boontawee 1995). The consequences may take many forms but at its most fundamental and irreversible, it involves the extinction of species (Groombridge 1992). Wilson (1988) and Myers (1986) estimate that 50 species are being driven to extinction per day. The vast majority of these extinctions are occurring in the tropical rainforests (Wilson 1988). Between 1976 and 1980, 1.8 million of an estimated 67 million hectares of closed forest were deforested annually, mainly in the tropics (Lanly 1982), and these rates have increased sharply since 1980 (FAO, 1990).

With this in mind, the methodology for the assessment of wildlife biodiversity is complex and a challenging task.

2.2 Approaches and Methodologies of Assessments

There are numerous approaches and methodologies for assessing and monitoring wildlife biodiversity using different tools and indicators. However, the "ecosystem approach" which is the primary framework for the implementation of the Convention on Biodiversity necessitated that in the assessment of wildlife biodiversity, all the components of biodiversity should be considered (Akpabio *et al*, 2001). The ecosystem approach is described as a strategy for management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential processes, functions and interactions among organisms and their environment, and among ecosystems. The assessment of wildlife biodiversity (Mammals and Herps) should include identification and monitoring of ecosystems and habitats as well as identification, monitoring and assessment of the targeted species.

The essence of this wildlife biodiversity survey was to detect and explain Mammals and Herps components of the Finima Nature Park, Bonny Island, Rivers State and identify important wildlife biodiversity (mammals, reptiles and amphibians species)

of the area and document their species diversity indexes ,ethno- zoology with a view to predicting their environmental and conservation prospects on the livelihoods of the human populations of the area together with the ecological balance of the affected region. The specific items of focus included but not limited to density, cover, frequency, abundance, diversity, sizes and age distribution, leading to the richness of the park.

Therefore, the Wildlife biodiversity eg, Primates, Ungulates, Chelonians, etc were surveyed using standard field methods and equipment. Thus, the wildlife biodiversity will be summarized and described both in quality and quantity in order to present the results in the most logical manner for ease of appreciation by both specialists and non-specialists.

3.0 TECHNICAL APPROACH

3.1 Survey Method

Ethno-zoology

The cultural uses and economic importance of wildlife species observed and identified in the study area will be determined through interview/discussion with farmers, hunters, herbalists, lumbermen, fishers, etc within the age brackets of 30 – 70 years.

The primary data presented in this report were collected through various methods which included:

Direct field observation: This method is confined to the assessment of visual indicators or aspects such as human activities on the landscape, vegetation cover, species diversity, types and quantity of bushmeat in local markets. General deterioration in vegetation cover and natural resources in general were also observed.

Rapid Rural Appraisal (RRA): This technique focused on group discussions with FNP staff, villagers representing different natural resources users, including male and female households. Group discussion questions focused on, species diversity, types and main uses, main threats and constraints to promotion and domestication as well as opportunities.

Key-informant: This technique focused on key informants including individuals (both male and female) who are directly or indirectly involved in forest and forest products within the area e.g. forestry staff, vendors, governments officials, Trade Unions (farmers and fishermen), and forest products traders.

Household interviews: The data collected at household levels covered qualitative and quantitative information. Regarding the diversity of wildlife species, their availability, main products, and uses, methods of extraction, management techniques, threats and security of supply and income generation were examined. The identification of the scientific names of the species was done by cross-refereeing the local people knowledge by matching vernacular names with published references and a number of scientific guides and Keys (Kingdon 1996; Cunningham and Cunningham, 2002; and Sunderland *et al*, 1998) were used to aid in identification of difficult species.

3.2 METHODS USED FOR SURVEY OF WILDLIFE BIODIVERSITY

The assessment was preceded by "scoping" to determine key wildlife issues of the area. Thereafter, a mix of methods, including literature search, reconnaissance visits, field exercises, and interviews with hunters, was adopted to gather vital information. These were augmented with diurnal and nocturnal forest expeditions to sight species and find evidence(s) of wildlife biodiversity of the area with a view to determining their abundance, distribution and density in specific sites. The end result is intended to predict project impacts on wildlife biodiversity and suggest practicable conservation measures. Keys to reptiles, mammals, snakes and lizards were used to identify members of different taxa eg (Romer, 1953; Rowe, 1996, Spawls and Branch, 1997; Hughes, 1983; Oyaberu and Shokpeka, 1984; Jean and Dandelot, 1999 and Dyer, 1981). Hunters were interviewed to know the kinds of animals that there were familiar with efforts made to contact knowledgeable elders of affected community to elicit information on ethno-zoology of the area. These findings are then tabulated as presented below.

4.0 RESULTS OF THE SURVEY

Biodiversity Situation of the Project Area

The area appear to be very rich in wildlife biodiversity (21 Mammals, 36 Reptiles and 18 Amphibians) in spite of human activities within the region and fragmentation coupled with petroleum industry activities, airstrip etc with intensive hunting and trapping around the communities which has led to disappearance of some of the medium to large mammals of the area. Hunters now go much further from the region to hunt. This is why the FNP project has potentials to foster the long term survival of threatened biodiversity and without the park, all would probably be gone.

Herp Fauna

Reptilian wildlife species were carefully surveyed and documented with Agama agama being the most abundant and Mabuya skinks being the next and a few snakes. The Workers and Villagers however described the presence of both the African Rock Python and the Ball or Royal Python which still abound in the area with some specimens stored in preservatives at the FNP office. The list of reptiles of the area is also presented below.

Reptiles of Finima Nature Park

Table 1*:* Checklist of Reptiles of FNP

S/n	*Classification*	*Common names*	*Uses*	*Abundance*	*Remarks*
1.	*Python sebae*	African Rock python	Food, medicine and skin	++	Endangered
2.	*Python regius*	Ball python	Pet trade	+	Rare
3.	*Bitis gabonica*	Gaboon viper	Meat	+	Rare
4.	*Naja nigricolis*	Spiting	Juju	+	Common

		cobra	ingredient		
5.	*Naja melanoleuca*	Forest cobra	Meat	+	Rare
6.	*Dendroaspis viridis*	Green mamba	?	+	Rare
7.	*Pseudohaje goldii*	Tree cobra	?	+	Rare
8.	*Botrhopthalmus lineatus*	Beautiful (Red lined) snake	Juju	+	Endangered
9.	*Lamprophis olivaceus*	Common house snake	Pest	+	Common
10.	*Mehelya poensis*	File snake	Pest	+	Rare
11.	*Grayia smythii*	Smyth's water snake	Meat	++	Common
12.	*Natriciteres sylvatica*	Forest mash snake	Pest	+	Rare
13.	*Natriciteres olivaceous*	Olive marsh snake	Pest	+	Rare
14.	*Psammophis philipsii*	Forest sand snake	Meat	+	Common
15.	*Crotaphopeltis hotamboeia*	White lipped snake	Juju	+	Common
16.	*Boiga blandingii*	Blanding's tree snake	Meat	+	Rare
17.	*Aparallactus modestus*	Giant centipede eater	?	+	Rare
18.	*Trachylepis boulengeri*	Common skink	?	+++	Common
19.	*Mabuya afinis*	Mabuya	?	++	Common
20.	*Varanus niloticus*	Water	Bushmeat	++	Common

		monitor lizard			
21.	*Agama agama*	Rainbow lizard	Juju	++++	Common
22.	*Crocodiles niloticus*	Nile crocodile	Bushmeat	+	Endangered
23.	*Osteolaemus tetraspis*	Dwarf crocodile	Bushmeat	++	Rare
24.	*Pelomedusa subrufa*	Marsh terrapin	Pet/bushmeat	+	Rare
25.	*Pelusious galamensis*	Forest hinged tortoise	Pet/bushmeat	+	Rare
26.	*Pelusious niger*	Black hinged tortoise	Pet/bushmeat	+	Rare
27.	*Kinixys erosa*	Forest tortoise	Pet/bushmeat	+	Rare
28.	*Hemidactylus frenatus*	House Gecko	Pest control	+++	Common
29.	*H. frenatus* young	House Gecko	Pest control	+++	Common
30.	*Hemidactylus turcicus*	House Gecko	Pest control	++	Common
31.	*Toxicodryas pulverulenta*	Beautiful Snake	Venomous	+	Common
32.	*Thelertornis kirtlandii*	Vine Snake	Venomous	+	Common
33.	*Hemidactylus spp*	House Gecko	Pest control	++	Common
34.	*Hemidactylus spp*	House Gecko	Pest control	++	Common

35.	***M**abuya (Trachylepis) spp*	Forest mabuya	Pest controller	++	Common
36.	*Bitis narsicornis*	Rhinocerus viper	Venomous	+	Rare

+ Abundance level (1 -5) lowest = 1 and 5 = Highest

Table 2: Amphibians of the FNP

S/N.	***Classification***	***Common name***	***Status***	***Uses***	***Abundance***
1.	*Xenopus spp*	Common platana	Rare	Delicacy	+
2.	*Arthroleptis spp*	Forest squeaker	Common	Delicacy	++
3.	*Arthroleptis stenodactylus*	Common squeaker	Common	medicine	++
4.	*Ptychadena mascariensis* *or* *Ptychadena oxyrhynchus*	Sharp nosed ridge frog	Common	Delicacy	+++
5.	*Bufo regularis*	Common toad	Common	Pest	++++
6.	*Bufo (Sclerophrys) gutturalis*	Guttural toad	Common	Pest	++
7.	*Bufo maculates*	Flat backed toad	Common	Pest	+++
8.	*Bufo brauni*	Braun's toad	Common	Pest	++
9.	*Ptychadena mascareniensis*	Mascrene ridged frog	Common	Delicacy	+++
10.	*Ptychadena taenioscelis*	Small ridged frog	Common	delicacy	+++
11.	*Bufo spp*	Toad	Common	Non edible	++

12.	*Arthroleptis spp*	Frog	Common	Non edible	++
13.	*Leptopelis spp*	Frog	Common	Non edible	+++
14.	*Hoplobatrachus occipitalis*	Frog	Common	Edible	++
15.	*Bufo spp*	Toad	Rare	Non edible	++
16.	*Ptychadena oxyrhynchus*	Frog	Common	Edible	+++
17.	*Afrixalus spp*	Frog	Common	Non edible	+++
18.	*Arthroleptis spp*	Frog	Common	Non edible	++

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APPENDIX 1- PHOTO GALLERY

Figure 1: Survey Team with NLNG Staff

Figure 1: *Hemidactylus frenatus*

Figure 2: *H. frenatus* young

Figure 3*: Hemidactylus turcicus?*

Figure 4*: Ptychadena mascareniensis*

Figure 5*: Bufo regularis*

Figure 6*:* Forest Vine Snake *Thelertornis kirtlandii*

Figure 7*: Bufo (Sclerophrys) gutturalis*

Figure 8: *Bufo spp*

Figure 9*: Arthroleptis_spp*

Figure 10*:* **Toxicodryas pulverulenta**

Figure 11*: Leptopelis spp*

Figure 12*:* **Hemidactylus spp**

Figure 13*:* **Hoplobatrachus occipitalis**

Figure 14: *Bufo spp*

Figure 15*: Hemidactylus spp*

Figure 16*:* Ptychadena oxyrhynchus

Figure 17*: Afrixalus spp*

Figure 18*: Arthroleptis spp*

Figure 19*: Mabuya (Trachylepis) spp* FNP

Figure 20: River Otter *(Hydrictis spp)* foot print at

Ornithology – Forest Birds and Waterbirds

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1.0 Introduction

The Finima Nature Park (FNP) is a freshwater swamp forest located on Bonny Island along Nigeria's southern coastal region. Bonny Island is located c. 40km southwest of Port Harcourt, the capital of Rivers state, in Nigeria's Niger Delta region which constitutes about 60% of Nigeria's over 800km southern coast line (Ogoro 2014). This region is a coastal belt of swamps bordered on the South by the Atlantic Ocean. It is rich in natural resources and the vegetation consists mainly of rainforests, mangroves, brackish and freshwater swamp forests which supports a rich and important diversity fauna.

A long history of economic activities mainly driven by trading and seaport activities and more recently by oil exploration and exploitation has led to the establishment of several trading and multinational oil companies in this region and especially on the Bonny Island. The increase in economic activity and the corresponding increase in human population density in this area means that the pressure on natural resources in this region could lead to habitat degradation and accelerated shoreline erosion which is currently estimated at between 20-30m per annum (Orupabo 2008).

The establishment of the Finima Nature Park by the Nigeria Liquefied Natural Gas Limited (NLNG) in 1999 was therefore in recognition of the very important need to preserve the now fast disappearing natural environment and ecosystems which remains crucial to sustaining the livelihoods of the local communities in this region (NLNG 2019). The Park is currently managed by the Nigerian Conservation Foundation (NCF) on behalf of the NLNG and the host communities. However, a plan is being put in place to encourage host community participation in the management of the park to ensure the sustainability of the initiative (NLNG 2019).

This rapid biodiversity (ornithological) assessment of FNP conducted on behalf of the Park management therefore sought to update and provide an inventory of the bird species in and around the Nature Park. Birds are ubiquitous and a vital component of the natural ecosystems. Most of them have beautiful colours and strong cultural links with people. Their high mobility allows them to easily move in and out of favourable and unfavourable environments such that they have come to be used as good indicators of environmental health. This rapid ornithological assessment also provides base line information about the avifauna of the FNP which is important for continued monitoring of the state of the biodiversity in FNP.

2.0 Methodology

2.1 Site description

FNP consists of 1000 hectares of freshwater swamp forests, mangrove swamps and also includes an ecologically important area of sandy soil with fresh water ponds and tall timber between the swamps and the beach (NLNG 2019). It is divided into an Eastern and Western block and with a core area of about 700 hectares and buffer zone of about 300 hectares. In addition to maintaining some of the last remaining natural habitats in the region, FNP also hosts recreational activities and functions as a research site for flora, fauna and the cultural heritage of Bonny Island (FNP 2019). So far, an interesting diversity of wildlife species including a variety of mammals, reptiles and bird

species e.g. including troops of Mona monkeys *Cercopithecus mona*, the African Fish Eagle *Haliaeetus vocifer*, flocks of White-face Whistling duck *Dendrocygna viduata* as well as the Endangered African Grey Parrot – *Psittacus erithacus* have all been reported from the Park.

2.2 Field surveys

The Line transect method was used during this ornithological assessment of FNP. Line transects are an efficient method used for bird surveys and involves the recording of all birds seen and heard while walking along well distributed transects.

Between 29th April and 4th May 2019, a total of eight transects along pre-existing trails and measuring 16,500 m were surveyed in FNP to identify and count all birds that were seen and heard. Five transects with a total length of about 8,300 m were surveyed in the Eastern forest block while another three transects with a total length of 8,200 m were surveyed in the Western forest block. The names and count of all identified bird species were recorded and distinctly kept for every 200 m section of the surveyed transect. The predominant habitat for the section was also recorded for every 200m. There were a total of 83 transect sections during the entire survey. Five major Habitat categories were described during the survey, namely: (i) Closed-canopy Forest (ii) Forest edge (iii) Secondary Forest (iv) Grasslands (including trimmed lawns and golf courses) and (v) Coastal (Beach) habitat (a combination of coastal vegetation, sandy areas and the Ocean). The total length of transects surveyed by habitat are shown in Table 1.

Table 1: The variation in survey effort (transect length surveyed) across habitats in Finima Nature Park, Bonny Island

Habitat	Closedcanopy forest	Forest edge	Secondary Forest	Grassland	Coastal (Beach) habitat
Transect length surveyed (meters)	6800	1900	2600	800	4400

Line transects were combined with mist netting which is used to capture, identify, mark (by fitting of numbered metal rings) before release of the now marked birds back to the wild. This capture-mark-release method is suitable for identifying other shy and less conspicuous birds that tend to be otherwise undetectable by other survey methods. Ringing of captured birds before release also helps to provide additional information about survival and local scale movement and habitat use by birds when this is repeated over a considerable time scale.

Four mist nets of 12 m each were set across the different habitats for about three hours on each of the three trapping days i.e. a total of c.9 trapping hours.

2.3 Data Analysis

The total count of all birds seen and heard was accumulated to produce an estimate of bird abundance for FNP during the study period.

Using the statistical packages 'Vegan' and 'BiodiversityR' in the R statistical software, a Species Accumulation Curve (SAC) was produced to illustrate the accumulation of species

as more sections of transects were being surveyed. Typically, as more sections are being surveyed, species are being recorded, the SAC initially begins to rise rapidly until most or all species in the area have been recorded and no new species are discovered such that the curve flattens out i.e. reaches an asymptote. A curve which fails to reach an asymptote indicates that more effort might be required to record most species in the study area.

The statistical packages were also used to estimate other standard bird population metrics and indices including Shannon-Weiner Diversity Index (SWDI) and to produce a species Rank Abundance Curve RAC. The Shannon-Weiner Diversity Index is a quantitative measure which accounts for both the abundance and evenness of the species present in a given area. It provides important information about rarity and commonness of species in a community, helping also in the identification of species dominance within an ecological community and are also illustrated using RACs. These Indices were estimated and compared across the different Habitat categories in FNP to provide information about any impact of the habitat and vegetation structure on the FNP avian community structure.

3.0 Results and Discussion

A total of 830 birds of 67 species were recorded during transect counts over the four days survey (Table 2). Another 12 species were also recorded in and around FNP off transects; giving a total of 80 species in and around FNP (Appendix Table 1).

Of the 67 species, five were common to all habitat categories, one was uniquely recorded in the forest, five along forest edges, three around the grasslands, seven in the open secondary forests while 11 were uniquely recorded along the coast habitats (Figure 2)

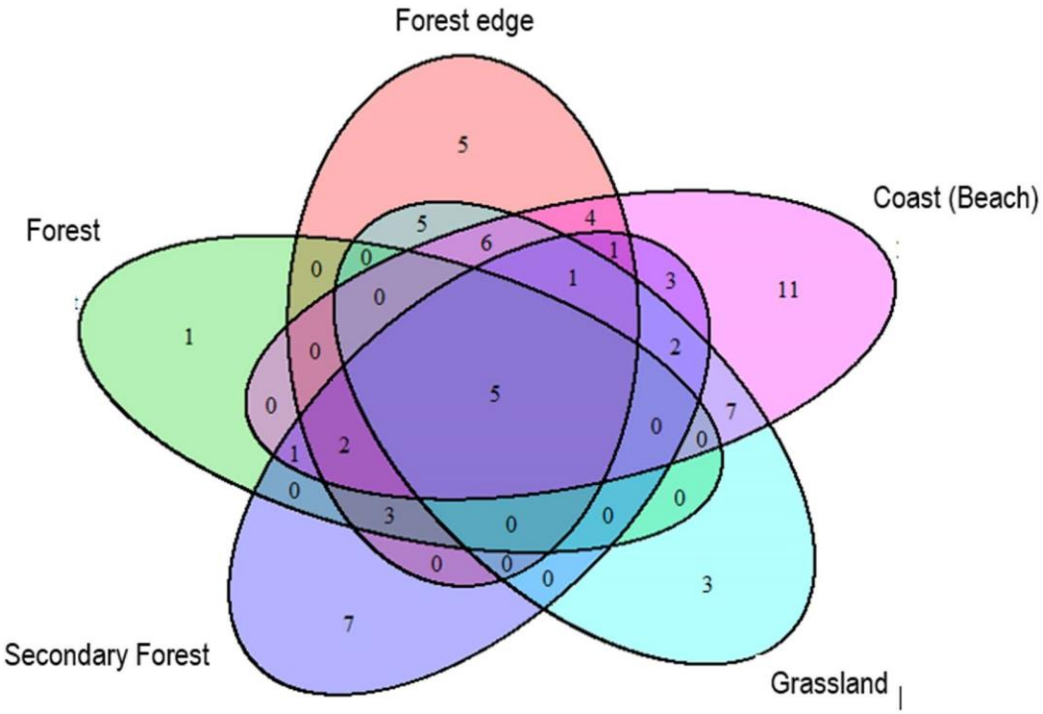

Figure 2: Venn diagram showing the unique distribution of species across habitat categories in Finima Nature Park, Bonny Island.

3.1 Assessing survey effort

The Species Accumulation Curve to illustrate the accumulation of species with effort (i.e. number of transect sections surveyed) showed a steady increase in species accumulation but did not appear to reach an asymptote even after a total 16,500 m of transects (82 sections of 200 m each and one section of 100 m) were surveyed (Figure 3). This is an indication that there are still more species to be recorded in the study area.

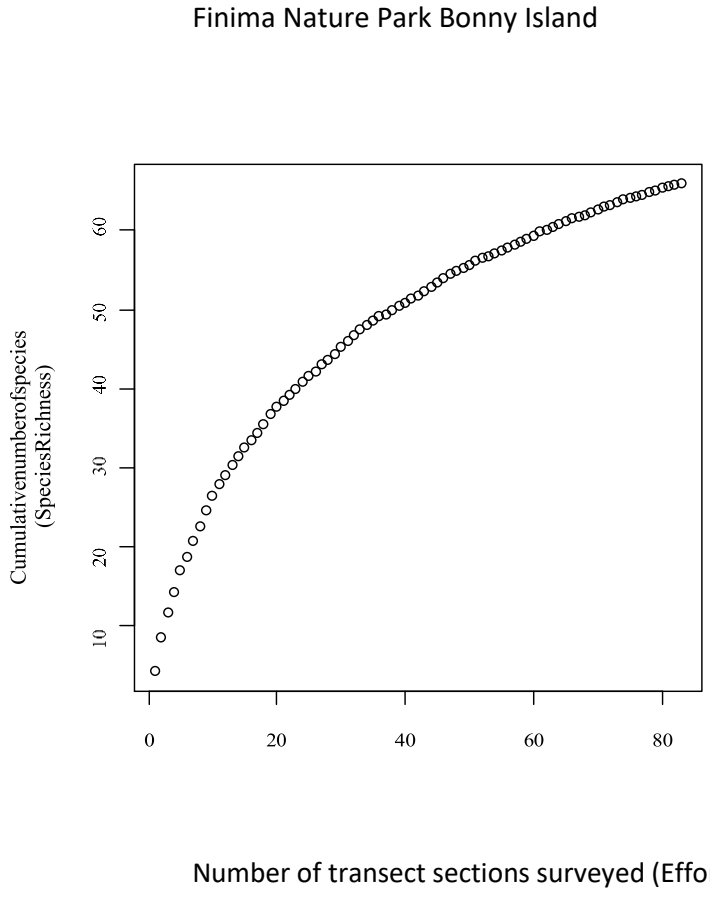

Figure 3: The rate of species accumulation with survey effort (here represented by number of transect sections surveyed).

3.2 Species of Conservation Interest

Of the total 80 species recorded in and around FNP, 19 species are species of conservation interest. The occurrence of seventeen of these species (Table 3) in other sites have led to the designation of those sites as Important Bird and Biodiversity Areas (IBAs). Twelve of

these species are listed as Category A3 Guinea-Congo forests Biome-restricted Assemblage species. Another five species are Category A4i species - trigger species for some IBAs in Nigeria where large congregations of their populations at certain sites have led to the designation of those sites as IBAs. Other species of conservation concern recorded at FNP include the Hooded Vulture *Necrosyrtes monachus* and the African Grey Parrot *Psittacus erithacus* which have been listed by IUCN as Critically Endangered (CR) and Endangered (EN) species respectively. The occurrence of these birds in FNP is therefore a testament to the importance of FNP for their maintenance and conservation and underscores the potential of this site to be designated as an IBA.

Table 3: A list of species of conservation interest recorded in FNP

Some Category A3 Biome-restricted Assemblage - A05

Guinea- Congo forests biome species recorded at FNP

Common Name	Species
White-spotted Flufftail	*Sarothrura pulchra*
Blue-headed Wood Dove	*Turtur brehmeri*
African Grey Parrot	*Psittacus erithacus*
African Pied Hornbill	*Tockus fasciatus*
Piping Hornbill	*Ceratogymna fistulator*
Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*
Chattering Cisticola	*Cisticola anonymus*
Green Hylia	*Hylia prasina*
Little Green Sunbird	*Nectarinia seimundi*
Bate's Sunbird	*Nectarinia batesi*
Reichenbach's Sunbird	*Nectarinia reichenbachii*
Blue-billed Malimbe	*Malimbus nitens*

Category A4i Congregation species recorded in FNP

Great White Egret	*Egretta alba*
Cattle Egret	*Bubulcus ibis*
White-faced Whistling Duck	*Dendrocygna viduata*
Senegal Thick-knee	*Burhinus senegalensis*
Spur-winged Lapwing	*Vanellus spinosus*

3.3 The Avian Community Structure at Finima Nature Park

3.3.1 Bird Species Diversity of FNP

The average Shannon-Weiner Diversity Index for birds in FNP was 1.1, sd = 0.6. There was a significant difference in the SWDI of bird species across the different Habitat categories in FNP (ANOVA: $F_{4, 78} = 3.04$, P = 0.02). The bird species diversity was significantly highest in the Grassland habitats (mean = 2.1, sd = 0.6) and least in the Forest interior (mean = 0.9, sd = 0.8) – Figure 4.

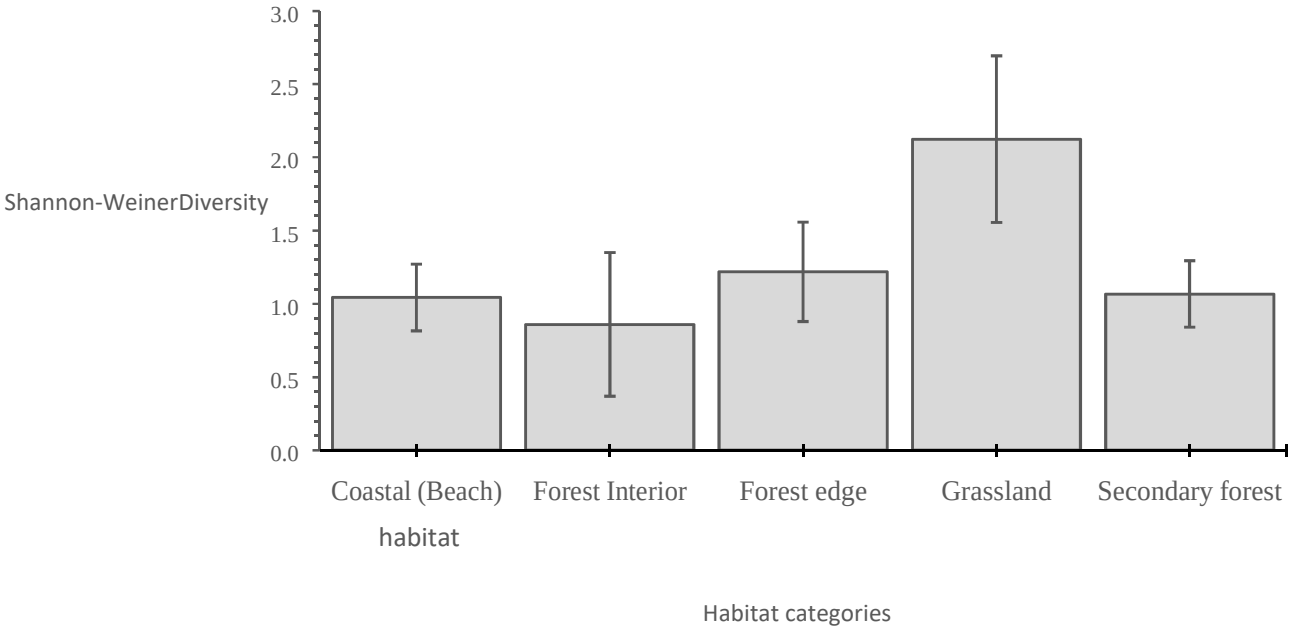

Figure 4: Variation in bird species diversity across habitat categories in Finima Nature Park, Bonny Island.

The observed variation in species diversity across habitats is possibly explained by the nature and structure of the different habitats. The relatively lower diversity observed in the Forest interior may be explained by the fact that it is a more homogeneous habitat which presents specific resources that are best exploited by Forest interior specialists. The other habitats (e.g. Forest edge, Grassland, Secondary Forests and Beach habitats) are more heterogeneous and often included a matrix of different habitats.
For example, areas described as Grassland mainly included the Lawns of the Golf Course within the NLNG - RA, the adjacent calls and in some areas, the forest edge. Such habitats that are more heterogeneous in nature, correspondingly offer a greater diversity of resources and may hence support a greater diversity of species.

3.3.2 Species Dominance

Visual examination of the steeply decelerating curve shown in Figure 5a below suggests an uneven distribution in bird abundance across the observed bird species in FNP. These illustrated results (Figure 5) suggests that about 10 species appear to dominate the avifauna community in FNP. A more even distribution of abundance across species will

produce a relatively less steep or horizontal curve. This species dominance pattern is similar even when considered across the five different habitat types in the study area (Figure 5b).

The top three species - Little Swift *Apus affinis*, Red-eyed Dove *Streptopelia semitorquata* and the Whitethroated Bee-eater *Merops albicollis* were found to be the most abundant and dominant species in FNP; at least between the end of April – early May when the survey was conducted.

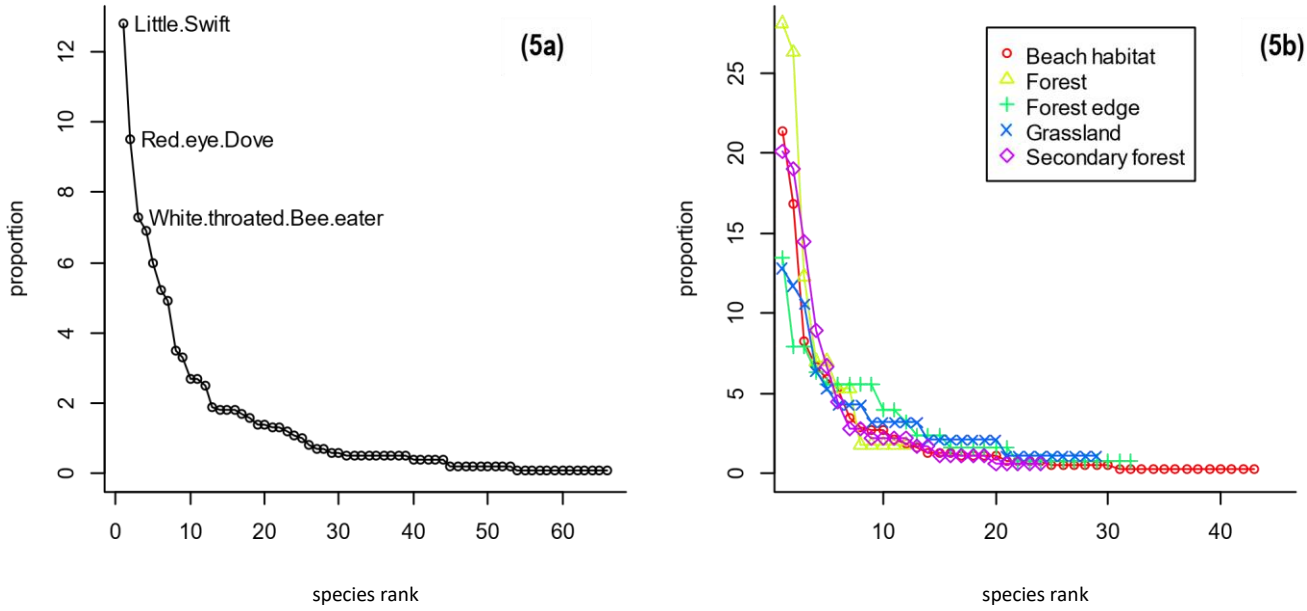

Figure 5: (a) The relationship between relative abundance (proportion) and dominance rank of species in FNP, Bonny Island (b) The relationship between relative abundance (proportion) and dominance rank of species across the different Habitat categories in FNP.

3.3.3 Species abundance and distribution

A total of 830 birds were recorded across all surveyed transects and habitats in FNP and there was a significant variation in the distribution of this abundance across habitat categories (Table 4, Poisson GLM: Deviance = 86.13, df = 4, P < 0.001). A significantly higher abundance of birds was recorded along the coastal habitats (374 birds) with the least abundance recorded from the forest interior (57 birds) (Table 4).

Table 4: Abundance distribution of bird species across habitat categories in FNP, Bonny Island

Habitat Category	Abundance (Total count of birds)
Coastal (Beach) habitat	374
Forest Interior	57
Forest edge	126
Grassland (Golf Lawns)	94
Secondary forest	179

A little more than half of the birds (429) were recorded in the Eastern block of FNP, while 410 birds were recorded in the Western Block. More birds were recorded along the coastal transects (364 birds), followed by the Agalanga Trail (205 birds), Resource Centre area & First Walkway (133 birds), Agaja Road & Agaja Nature trail (72 birds) and Hippo Creek Trail (Adjacent RA golf course) – 56 birds. More details about the abundance distribution of species and birds across transects and forest blocks is included in Table 5.

Table 5: Abundance distribution of species recorded across transects in both forest blocks in Finima National Park, Bonny Island

Family	Common Name	Eastern Block					Western Block		
		T1	T2	T3	T4	T7	T5	T8	T6
PHALACROCORACIDAE	Long-tailed Cormorant					1	2		
ANHINGIDAE	African Darter						1		
ARDEIDAE	Black-headed Heron					2	1		
	Cattle Egret	2					3		5
	Green-backed Heron					1	1		
	Grey Heron							2	
	Great White Egret					1	1		1

	Purple Heron					2				
	Western Reef Heron	1				8				
ANATIDAE	White-faced Whistling Duck	2					2			
PANDIONIDAE	Osprey					1				
ACCIPITRIDAE	Palmnut Vulture		2		4	5	2	2		1
	Shikra									1
	Yellow-billed Kite		1		1	8	8	22		3
	African Fish Eagle				1					
SAROTHRURIDAE	White-spotted Flufftail	1	2		3		4			1
JACANIDAE	African Jacana	1					2			2
BURHINIDAE	Senegal Thick-knee					11	2			
	Water Thick-knee					1				3
CHARADRIIDAE	Spur-winged Lapwing						4			
SCOLOPACIDAE	Common Sandpiper	1								
COLUMBIDAE	African Green Pigeon			1		4				7
	Blue-spotted Wood Dove						1			
	Laughing Dove									1
	Red-eyed Dove				1	45	13	18		2
	Tambourine Dove		2							
CUCULIDAE	Red-chested Cuckoo					1				
	Senegal Coucal					1				
	Yellowbill					2				1
APODIDAE	African Palm Swift					18	7	4		
	Little Swift	1	2			58	14	22		
ALCEDINIDAE	Blue-breasted Kingfisher					13	1	7		1
	Giant Kingfisher					3	1			
	Malakite Kingfisher						2			
	Pied Kingfisher					1				
	Woodland KingFisher	4				8	4	2		3
MEROPIDAE	White-throated Bee-eater						36	25		
CORACIIDAE	Broad-billed Roller						1	1		
BUCEROTIDAE	Pied Hornbill		3		3	1	1			
	Piping Hornbill		2			5	4			

RAMPHASTIDAE	Yellow-throated Tinkerbird	2	12	1	15	2	16		2
HIRUNDINIDAE	Common House Martin						2	4	
	Ethiopian Swallow					1	6	12	8
MOTACILLIDAE	Plain-backed Pipt					2			
PYCNONOTIDAE	Common Bulbul	2	1		1	3	4	2	2
	Little Greenbul	6	26		16		9		
CISTICOLIDAE	Chattering Cisticola			1		1	1	3	
SYLVIIDAE	Grey-backed Camaroptera			2		2			
	Green Hylia	2	5		7		8		
REMIZIDAE	Tit Hylia						2		
NECTARNIIDAE	Collared Sunbird		1						
	Little Green Sunbird		2						
	Olive-bellied Sunbird						1		
	Olive Sunbird		8	1	4			1	
	Riechenbach's Sunbird					1	1	1	2
CORVIDAE	Pied Crow	13	1			3	14	7	3
STURNIDAE	Splendid Glossy Starling	1					3		
PASSERIDAE	Grey-headed Sparrow					6	3		3
PLOCEIDAE	Black-necked Weaver					1		2	1
	Village Weaver					1	12	2	
	Blue-billed Malimbe		4						
ESTRILDIDAE	Black-bellied Seedcracker			7					
	Bronze Mannikin	1					5		
	Grey-headed Negrofinch		1	2	1				

Numbers in black filled cells indicate the total count (abundance)

Key:
T1: Resource Centre area
T2: First Walkway
T3: Agaja Road (Park boundary)
T4: Agaja Nature Trail
T5: Agalanga Trail
T6: Hippo Creek Trail (Adjacent RA Golf course)
T7: Coastal (Beach) Transect 1 – East of RA Fallout
T8: Coastal (Beach) Transect 2 – West of RA Fallout

3.4 Other observations

One case of wood collection and some evidence of previous wood collection incidents were observed during this survey. However, the forest still largely appears to be well protected and is clearly a valuable remnant of the vegetation in this region.

The reported cases of shoreline erosion and coastal degradation associated with coastal environments also appears to be having considerable effects especially along the southern coastal habitats of the Park as some parts of the coastal vegetation is being covered by sand and lots of plastic waste washed inland by the ocean currents.

4.0 Conclusions and Recommendations

The management strategy for FNP appears to be quite effective as most of the forest vegetation appears to be recovering well. The forest is certainly a valuable remnant of a fast disappearing habitat in this part of the world and the occurrence of 17 species of conservation interest that have contributed to the designation of other areas as IBAs further highlights the important potential of FNP as a biodiversity conservation sanctuary.

However, it is important that this area continues to be managed and protected from the increasing pressure for unsustainable exploitation of its forest resources that only looks likely to increase as the population continues to grow. Continued and sustained engagement and awareness programmes with the surrounding host community is recommended as a measure to mitigate this potentially increasing pressure.

The setting up of (or continued investment in) a Tree Nursery programme that grows indigenous trees is also recommended. The Nursery will serve as a ready source for saplings for a re-forestation programme targeted especially towards restoring the degrading coastal vegetation in the Park.

It is important also for an ornithological (and biodiversity) monitoring programme to be put in place in FNP in order to provide long term data which is often needed to determine the effectiveness of management interventions such as the current programme in FNP. Consequently, comprehensive training of some of Park guards and rangers (especially for those who participated during this survey) in bird and biodiversity survey techniques is also recommended and the team that conducted this survey is available to provide this training.

Although a considerable diversity of birds, including species of conservation interests have been recorded during this survey, this is certainly only a sub-set of the expected diversity for FNP as the avian community was largely composed of Afrotropical resident bird species. For a more complete estimation of the avian community, it is important that this survey is repeated during other parts of the year. Specifically, a repeat survey is recommended especially during the dry season as this survey was conducted during the wet season. A survey during the dry season is crucially important to identify and record the other migratory (seasonally resident) species which may only seasonally utilize this habitat.

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Appendix Table 1: A checklist of all bird species recorded in FNP

Family	Species	Scientific Name	Status
PHALACROCORACIDAE	Long-tailed Cormorant	Microcarbo africanus	LC
ANHINGIDAE	African Darter	Anhinga rufa	LC
ARDEIDAE	Cattle Egret	*Bubulcus ibis*	LC
	Green-backed Heron	*Butorides striata*	LC
	Western Reef Egret	*Egretta gularis*	LC
	Intermediate Egret	*Ardea intermedia*	LC
	Great Egret	*Ardea alba*	LC
	Purple Heron	*Ardea purpurea*	LC
	Grey Heron	*Ardea cinerea*	LC
	Black-headed Heron	*Ardea melanocephala*	LC
CICONIDAE	African Openbill Stork	*Anastomus lamelligerus*	LC
	Woolly-necked Stork	*Ciconia episcopus*	LC
THRESKIORNIITHIDAE	African Sacred Ibis	*Threskiornis aethiopicus*	LC
ANATIDAE	White-faced Whistling Duck	*Dendrocygna viduata*	LC
PANDIONIDAE	Osprey	*Pandion haliaetus*	LC
ACCIPITRIDAE	Yellow-billed Kite	*Milvus migrans parasitus*	LC
	African Fish Eagle	*Haliaeetus vocifer*	LC
	Palmnut Vulture	*Gypohierax angolensis*	LC
	Hooded Vulture	*Necrosyrtes monachus*	CR
	African Harrier Hawk	*Polyboroides typus*	LC
	African Goshawk	*Accipiter tachiro*	LC
	Shikra	*Accipiter badius*	LC
	Lizard Buzzard	*Kaupifalco monogrammicus*	LC
SAROTHRURIDAE	White-spotted Flufftail	*Sarothrura pulchra*	LC
RALLIDAE	Black Crake	*Zapornia flavirostra*	LC
JACANIDAE	African Jacana	*Actophilornis africanus*	LC
BURHINIDAE	Senegal Thick-knee	*Burhinus capensis*	LC
	Water Thick-knee	*Burhinus vermiculatus*	LC
CHARADRIIDAE	Spur-winged Lapwing	*Vanellus spinosus*	LC
SCOLOPACIDAE	Common Sandpiper	*Actitis hypoleucos*	LC
COLUMBIDAE	African Green Pigeon	*Treron calvus*	LC
	Tambourine Dove	*Turtur tympanistria*	LC
	Blue-spotted Wood Dove	*Turtur afer*	LC
	Red-eyed Dove	*Streptopelia semitorquata*	LC
	Laughing Dove	*Streptopelia senegalensis*	LC

PSITTACIDAE	Grey Parrot	*Psittacus erithacus*	EN
CUCULIDAE	Red-chested Cuckoo	*Cuculus solitarius*	LC
	Didric Cuckoo	*Chrysococcyx caprius*	LC
	Yellowbill	*Ceuthmochares aereus*	LC
	Senegal Coucal	*Centropus senegalensis*	LC
APODIDAE	African Palm Swift	*Cypsiurus parvus*	LC
	Little Swift	*Apus affinis*	LC
ALCEDINIDAE	Blue-breasted Kingfisher	*Halcyon malimbica*	LC
	Woodland KingFisher	*Halcyon senegalensis*	LC
	Malachite Kingfisher	*Corythornis cristatus*	LC
	Giant Kingfisher	*Megaceryle maxima*	LC
	Pied Kingfisher	*Ceryle rudis*	LC
MEROPIDAE	White-throated Bee-eater	*Merops albicollis*	LC
CORACIIDAE	Broad-billed Roller	*Eurystomus glaucurus*	LC
BUCEROTIDAE	African Pied Hornbill	*Tockus fasciatus*	LC
	Piping Hornbill	*Bycanistes fistulator*	LC
RAMPHASTIDAE	Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*	LC
HIRUNDINIDAE	Ethiopian Swallow	*Hirundo aethiopica*	LC
	Common House Martin	*Delichon urbicum*	LC
MOTACILLIDAE	Plain-backed Pipt	*Anthus leucophrys*	LC
	Yellow wagtail	*Motacilla flava*	LC
	Yellow-throated Longclaw	*Macronyx croceus*	LC
PYCNONOTIDAE	Little Greenbul	*Eurillas virens*	LC
	Common Bulbul	*Pycnonotus barbatus*	LC
CISTICOLIDAE	Chattering Cisticola	*Cisticola anonymus*	LC
SYLVIIDAE	Grey-backed Camaroptera	*Camaroptera brachyura*	LC
	Green Hylia	*Hylia prasinia*	LC

REMIZIDAE	Tit-hylia	*Pholidornis rushiae*	LC
NECTARINIIDAE	Little Green Sunbird	*Anthreptes seimundi*	LC
	Reichenbach's Sunbird	*Anabathmis reichenbachii*	LC
	Olive Sunbird	*Canomitra olivacea*	LC
	Collared Sunbird	*Anthodiaeta collaris*	LC
	Olive-bellied Sunbird	*Cinnyris chloropygius*	LC
	Bate's Sunbird	*Cinnyris batesi*	LC
CORVIDAE	Pied Crow	*Corvus albus*	LC
STURNIDAE	Splendid Glossy Starling	*Lamprotornis splendidus*	LC
PASSERIDAE	Northern Grey-headed Sparrow	*Passer griseus*	LC
PLOCEIDAE	Slender-billed Weaver	*Ploceus pelzelni*	LC
	Black-necked Weaver	*Ploceus nigricollis*	LC
	Village Weaver	*Ploceus cucullatus*	LC
	Blue-billed Malimbe	*Malimbus nitens*	LC
ESTRILDIDAE	Grey-headed Negrofinch	*Nigrita canicapillus*	LC
	Black-bellied Seedcracker	*Pyrenestes ostrinus*	LC
	Bronze Mannikin	*Spermestes cucullata*	LC
VIDUIDAE	Pin-tailed Whydah	*Vidua macroura*	LC

Appendix 2: Photos gallery of some birds observed during the survey

		
Great White Egret	Western Reef Egret	Grey (Pallid) Heron
		
Lizard Buzzard	African Fish Eagle	Slender-Billed Weaver
		
Water Thick-Knee	Spur-Winged Lapwing	White-Throated Bee-eater

Long-Tail Cormorant

Ethiopian Swallow

Yellow-Throated Tinkerbird

Yellow-Billed Kite

Green-Backed (Straited) Heron

Black Crake

The survey team at the bird ringing table

The survey team during the survey of the First Walkway transect

Vegetation and Plant Diversity

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1.0 INTRODUCTION AND LITERATURE REVIEW

The Finima Nature Park, located south of Bonny (04° 271 N) was established by the Nigerian Liquefied Natural Gas Company (NLNG) in 2001, to protect the forests for its integrity, its biodiversity and the normal functioning of the natural environment that also provides for and protects the human settlements in the Bonny and Finima communities. NLNG saw the establishment of the Park as its contribution to national and global conservation, in line with Rio Agenda 21, Ramsar Convention, and Convention on Biological Diversity. It is also for recreation, and research on the fauna, fora and cultural heritage of Bonny Kingdom (http://www.nigerialng.com/Our-Environment/Pages/Conservation.aspx, accessed 04 May 2019; https://www.ncfnigeria.org/projects/finima-nature-park , accessed 04 May 2019). The Park completely surrounds the NLNG Residential Area. Finima Nature Park is managed by the Nigerian Conservation Foundation (NCF) that has thought fit to carry out a rapid biodiversity survey of the 1,000-hectare Park. This report covers the vegetation aspect of the biodiversity survey. As observed by the Nigeria National Biodiversity Strategy and Action Plan (not dated), there has been a steep increase in biodiversity loss in Nigeria and the situation has elicited numerous initiatives aimed at promoting sustainable conservation and utilization of biodiversity as a means of improving the well-being of those whose livelihoods are tied to the forests. Endangered plants (and animals) are known but the list of threatened species keeps growing (see Okafor 2010, Isichei 2010)

Vegetation, the totality of plants in an area, is most often dependent on the substratum on which the plants are growing. Anderson (1966) classified the soil of the area as Freshwater Alluvial. White (1983) classified the vegetation as Guinea-Congolian swamp forest and riparian forest. But it should be noted that a stretch of mangrove vegetation occurs along the seashore, to the south. White notes that the swamp forest is similar in appearance to rain forest and that the tallest trees attain a height of 45 m. the main canopy, however, is irregular and rather open (see also Onochie 1979). It is characterized by dense tangles of shrubs and lianes and tree gaps are filled by climbing palms especially *Ancistrophyllum*, *Eremospath*a and *Calamus*. Freshwater swamp forest is poorer in species than rain forest. Many trees have stilt roots. Mangrove vegetation is also poor in species and in Nigeria there are just five woody species – three *Rhizophora* species and *Avicennia* and *Laguncularia* (Lewis and Jackson 1983). There are transition shrubs (between salt water and freshwater) as well as herbaceous plants that are characteristic of the sea shore (Lawson 1986; Agbagwa and Ekeke 2011; Dappa and Ndukwu 2018).

2.0 STUDY METHODOLOGY

A map of the Finima Nature Park is shown in Figure 1. It is bordered to the south by the Bight of Biafra and surrounds on all four sides the residential area (RA) of NLNG. The settlement to the northwest is new Finima. Industrial establishments are directly to the north and Bonny town further north. Bonny is about 40 km south of Port Harcourt. The narrow strip of vegetation to the south of RA is mostly mangrove while to the east and west are freshwater swamps. The OGGS gas pipeline forms the northeastern boundary of the Park. Agaja community is to the northeast while Sebekiri is to the northwest.

2.1. Rapid Vegetation Survey Methodology

Detailed vegetation survey was not feasible for two reasons: most of the area, being freshwater swamps, was flooded; the size of the Park, 1000 ha could not be covered in the short time frame available. There are four trails and raised walkways that are used as access to the various parts of the Park and for monitoring (see Figure 1). These were used for reconnaissance and assessment of the Park. The aim of the reconnaissance was to know the types/sub-types of vegetation and their component species. Field guides for plant identification were taken along and Park Rangers who were employees of NCF, namely, Mr. Zacchaeus Adaria, Mrs. Hanna Brown and Mr. Ofen Ettah. Several photographs were also taken of the vegetation and individual species. Species that could not be identified in the field were collected and matched with internet images. As much as possible, plants were identified to species level. Plant names are according to Burkill (1985 – 2004) and Keay (1989).

3.0 OBSERVATIONS. (Plant Families are presented in Appendix 1)

i. Resource Centre to Ranger Post (North of RA)

The most frequently observed woody plants along this 1.5 km trail (Plates 1, 2, 3) include *Alchornea cordifolia, Alstonia boonei, Anthocleista spp., Anthostema aubryanum, Calamus deeratus, Cleistopholis patens, Elaeis guineensis, Funtumia elastica, Harungana madagascariensis, Klainedoxa gabonensis, Laccosperma sp., Lophira alata, Macaranga spp., Musanga cecropioides, Pierrreodendron africanum, Psydrax subcordata, Pycnanthus angolensis, Rauvolfia caffra, Sterculia tragacantha, Terminalia catappa, Vernonia conferta, Xylopia aethiopica*

Due to cutting of the trail, thereby opening up the canopy and allowing weeds to grow, there were ruderal weeds including, *Chromolaena odorata, Costus afer* and *Dissotis erecta. Selaginella sp.* and *Lycopodium sp.* were dominant ground plants. There were a few stands of *Cyclosorus afer*. *Cyrtosperma*

senegalense was abundant in the waterlogged areas. *Tetracera alnifolia* was the major climber in the exposed areas

A rapid sampling of woody stem density in five 20 x 20 m plots was carried out along this trail. Woody stem density ranged from 150 to 750 ha^{-1} with a mean of 430 stems per ha. Most of the trees were below 100 cm girth at breast height, except for a *Pierreodendron* tree that had a girth of 300 cm. Most of the oil palm trees were seedlings

ii. Agaja Nature Trail

This trail is extensively waterlogged and access is through a raised wooden walkway. It is more typical of freshwater swamp forest than the first Trail (Plates 4 & 5). It is also more mature, based on the girths of trees and general outlook. Woody plants sighted include *Anthocleista spp*., *Anthostema aubryanum, Macaranga spp., Raphia hookeri, Rothmania spp., Vernonia conferta, Xylopia spp. Cleistopholis patens, Uapaca guineensis, Cyrtosperma senegalens* and *Diplazium sammati* were also present. Climbers such *as Laccosperma secundiflorum* and *Culcasia scandens* were present. The ferns, *Diplazium sammatii* and *Selaginella myosorus* were also seen; *Pandanus candelabrum* and *Alchornea cordifolia* were abundant.

iii. OGGS Pipeline Route

The OGGS pipeline and its right of way marks the norther boundary of the Finima Park (Plates 8, 7, 8a). The dominant tree in this section of the Park is *Hallea ledermannii* (synonym: *Mitragyna ciliata*); also abundant are *Anthostema aubryanum*, *Pandanus candelabrum*, Macaranga spp., In addition to these, the freshwater swamp forest species mentioned in the earlier trails were sighted.

iv. Seashore through the OGGS Pipeline and the Waterfront of the West side of RA.

This is a sandy shore (Plates 8, 9, 10, 11, 12, 13,14). The most noticeable plants include *Ipomoea pes-caprae*, *Sporobolus virginicus* and *Dalbergia ecastaphyllum*. Woody plants observed away from the shoreline include *Chrysobalanus orbicularis*, *Terminalia catappa* and *Casuarina equsetifolia*. At the approach from the OGGS pipeline route, there is a creek lined with *Rhizophora racemosa*. The sandy shore is littered with fruits and seedlings of *Nypa fruticans* and *Rhizophora.*

The western side of RA also has a sandy beach. Between the RA fence and the beach is mangrove vegetation (Plates 12 – 15). First, the shoreline has *Canavalia rosea* as the pioneer vegetation. Inland is *Avicennia africana*. A few stands of *Laguncularia racemose* (Plate 15) were observed. Stands of *Nypa* were growing in the water channels.

v. Agalanga Nature Trail – Hunters' Camp – Sebikiri (Plates 15, 16, 17, 18, 19)

The nearly 5 km trail has more mature freshwater swamp forest than any other part of the Finima Park. There is also evidence of farming activities in the recent past. Some of the species observed include: *Anthostema aubryanum, Barteria nigritina, Carthormion altissimum, Chrysobalanus icaco, Cleistopholis patens, Costus afer, Culcasia scandens, Cyclosorus s.p, Cyrtosperma senegalense, Dracaena sp., Elaeis guineensis, Erythrophleum ivorense, Hallea ledermani, Klainedoxa gabonensis, Laccosperma secundiflorum, Lophira alata, Macaranga spp., Massularia acuminate, Nauclea didderichii, Ouratea callophylla, Pandanus candelabrum, Pentadesma butyraceae, Piper guineensis, Raphia hookeri, Sacoglottis gabonensis, Spondianthus preussii, Uapaca spp.* Several woody climbers were also observed.

There are indications of recent farming activity along this Trail, before Hunters' Camp. Remnants of cassava (*Manihot esculentus*) are visible. Regrowth of *Alchornea cordifolia*, weeds and *Nephrolepis biserrata* were observed.

4. RECOMMENDATIONS

I. The Finima Nature is located in an area where conserved areas are few and population pressure is very high. The Niger Delta is part of WWF "200 Ecoregion" and is ranked #155 in the world list of biodiversity hotspots. It is Africa's largest mangrove area and the world's third largest and is one of the largest wetlands in the world and is Africa's largest Delta. Away from the Bonny island, the Delta's outermost coastal forest zone ('barrier island') represents some of the last remaining pristine forest resources and centres of endemism in Africa. So the Park, in view of the role vegetation plays in ethnobotany and in ameliorating climate change, (e.g. Isichei 2005), should be highly valued and upgraded to a Biosphere Reserve. NCF should work with the Rivers State Government to grant the Park an official status as a conservation area.

II. The present management system is commended because it guarantees co-operation with the locals and ensures minimal encroachment

III. It is observed that NCF is making efforts at reforestation by establishing plant nurseries and planting native trees in the Park. This is commendable. But the selection of mangroves has to done carefully since the different species vary in their salt tolerance and the type of soil they thrive on.

IV. It is recommended that an Herbarium be established as part of the Resource Centre

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Erythrophleum ivorensis and Oil palm

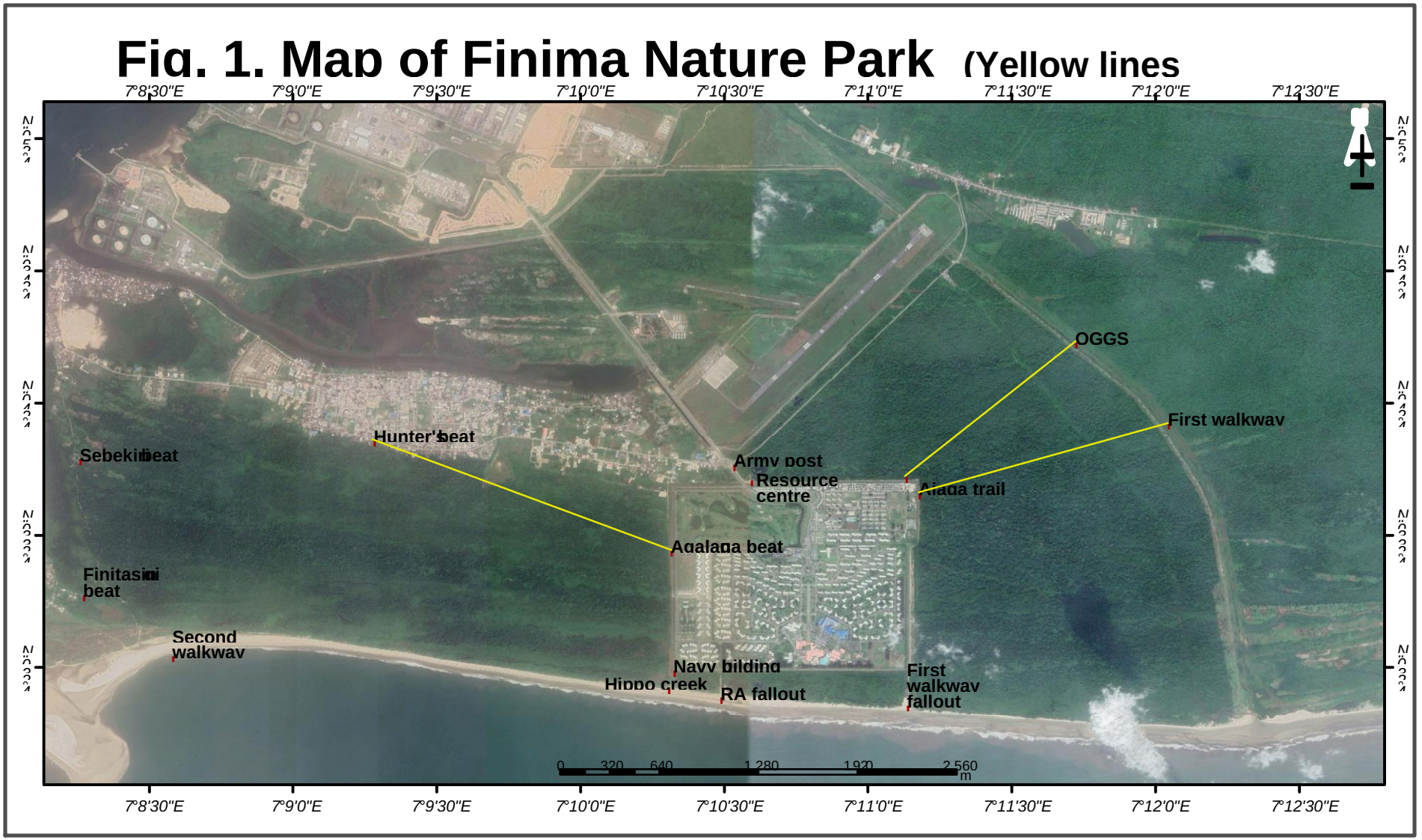
Dense Stands of *Hallea ledermanni*

Dalbergia on Bonny Sandy shore

Appendix 1. PLANT NAMES AND THEIR FAMILIES

Plant Name	Family
Anthostema aubryanum	Euphorbiaceae
Barteria nigritina	Passifloraceae
Calamus deeratus	Arecaceae
Canavalia rosea	Fabaceae
Carthormion altissimum	Fabaceae
Chromolaena odorata	Compositae
Chrysobalanus icaco	Chrysobalanceae
Cleistopholis patens	Annonaceae
Costus afer	Zingiberaceae
Culcasia scandens	Araceae
Cyclosorus s.p	Thelypteridaceae
Cyrtosperma senegalense	Araceae
Diplazium sammatii	Athyriaceae
Dissotis erecta	Melastomataceae
Dracaena sp.	Agavaceae
Elaeis guineensis	Arecaceae
Erythrophleum ivorense	Fabaceae
Hallea ledermani	Rubiaceae
Harungana madagascariensis	Guttiferae
Klainedoxa gabonensis	Irvingiaceae
Laccosperma secundiflorum	Arecaceae
Lophira alata	Ochnaceae
Plant Name	**Family**
Massularia acuminate	Rubiaceae
Musanga cecropioides	Moraceae
Nauclea didderichii	Rubiaceae
Nephrolepis biserrata	Pteridophyta
Ouratea callophylla	Ochnaceae
Pandanus candelabrum	Pandanaceae
Pentadesma butyraceae	Guttiferae
Piper guineensis	Piperaceae
Pierrreodendron africanum	Simaroubaceae
Psydrax subcordata	Rubiaceae
Pycnanthus angolensis	Myristicaceae
Raphia hookeri	Arecaceae
Rauvolfia caffra	Apocynaceae
Sacoglottis gabonensis	Humiriaceae
Spondianthus preussii	Euphorbiaceae
Sterculia tragacantha	Sterculiaceae
Terminalia catappa	Combretaceae
Tetracera alnifolia	Dilleniaceae
Uapaca spp.	Euphorbiaceae
Vernonia conferta	Compositae

Fig. 1. Map of Finima Nature Park (Yellow lines



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