WET SEASON FISHERIES ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

WET SEASON FISHERIES ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

1 INTRODUCTION

Phase I of the Kampala-Jinja Expressway PPP (KJE) comprises the Kampala Southern Bypass (KSB) and the Kampala-Jinja Expressway mainline as far as Namagunga, Buikwe District. The Kampala Southern Bypass is a proposed four-lane, dual carriage highway connecting Bweyogerere to Munyonyo. The road will start at Bweyogerere on the Kampala–Jinja Expressway (KJE), near Mandela National Stadium at Namboole. It will pass through Butabika, Luzira, Kyeyitabya and Heritage village to end at Munyonyo, where it will join the southern spur of the Entebbe–Kampala Expressway. The KJE mainline (Phase 1) will start at the Lugogo Bypass-Jinja Road junction near Shoprite, continue along the existing Jinja Road through Nakawa, and turn at Spear Motors Ltd to go through Kinawataka, Bweyogerere, Namanve, Namilyango, Mukono, Mbalala and Namataba, ending at Namagunga.

The purpose of this study is to assess the fisheries along the Phase 1 alignment as part of the ESIA for the Kampala–Jinja Expressway PPP Project (Phase 1). It includes description of a 5-day fish survey of aquatic resources that took place on the 19th – 23rd of December 2017. This report is an input to the update of the Environmental and Social Impact Assessment (ESIA), required to provide baseline information for the design and implementation planning for the KJE project.

1.1 Objectives of the Study

The main objective was to provide baseline information on aquatic habitat and fish species in the area that will be traversed by the Phase 1 alignment.

Specific objectives were:

- To assess the current extent of modified and/or natural habitat, with special attention on areas within the project area that are selected for future clearing and development.
- To assess the presence or absence of aquatic biodiversity, including its location, status and condition, and the areas of habitat, key resources and critical areas that support biodiversity.
- To prescribe recommendations for management and monitoring measures required for compliance with IFC PS 6 requirements.

1.2 Scope of Study

The study covered aspects of habitat characterisation, fish diversity, potential project impacts, and mitigation, management and monitoring measures. The geographical scope of the study was limited to selected aquatic resources along the Kampala-Mukono (Phase 1) stretch including Sezibwa River, Mayanja wetland, Kansanga Wetland (Bukasa), Nakivubo wetland (Bugolobi), Kinawataka wetland, Namanve wetland and Kasaala (Mbalala) wetlands. Investigation points were located along or within 300 metres of the shoulders of the proposed road, according to the alignment provided by UNRA (client). The study also considered neighbouring projects and populations which could be directly or indirectly affected by implementation of the project.

1.3 Study Methodology

The study was conducted in line with the Environment Impact Assessment Regulations of 1998, and the 1997 NEMA Guidelines for Environment Impact Assessment in Uganda.

The methods employed included a literature review, consultations with local fishermen, and project site visits for direct observations, photography and fish sampling.

The aquatic baseline study was undertaken from 19th to 23rd December 2017, which was the end of a wet season. For each aquatic habitat, one to two sampling points were investigated. Investigation points were selected within 300 metres of the proposed KJE boundary. Habitat quality was assessed by observation, supported by photographs and geo-referencing of points within the habitats.

To determine fish species diversity within a habitat, gillnets and baited (with dried fish and breed) minnow traps were used. Two gill nets (of 3- and 4-inch mesh size) were set along the Sezibwa River, parallel to the river flow, fastened onto vegetation and left overnight. Gillnets were used in Mayanja wetland and Sezibwa River, where water depth was >0.5m.

Two baited minnow traps were set in vegetated shallow shorelines and wetlands, fastened onto vegetation and left overnight. Plate 1.1 shows the methods used to collect fish.

Trapped fish species were identified using illustrations and descriptions from FishBase. The conservation status of recorded fish species was assessed using FishBase and IUCN (2017).

To obtain further information about the fish species that were caught, interviews with local fishermen were held.

a) **Setting the minnow traps**

b) **Setting the gill nets**

c) Consultation with local fishermen at a fish pond

Plate 1.1: Fish sampling methods

2 BASELINE ENVIRONMENTAL CONDITIONS

2.1 Mayanja Wetland

2.1.1 Habitat Conditions

Mayanja River runs from Wankulukuku in Rubaga Division, across Entebbe Road through Makindye Ssabagabo in Wakiso District, and ends at Lake Victoria at Munyonyo. Most of its upstream catchment, including in the areas of Kaliddubi, Gangu, Buziga, Ndikuttamada and Luwafu, has been destroyed by agriculture, settlement, industrialisation and other activities (Government of Uganda, 2016), leaving good habitat in almost only the areas of Kibiri and Munyonyo. Mayanja Wetland receives storm and waste water from surrounding areas and far beyond, through two streams (Mayanja and Kaliddubi) flowing eastward, parallel to each other, to Lake Victoria.

Mayanja wetland at the Munyoyo site has two distinct parts – the upper and lower. The upper part is highly modified by urban sprawl while the lower part is relatively intact and dominated by papyrus (see Figure 2.1). The southern spur of the Kampala-Entebbe Expressway runs SW-NE at the boundary of the two parts. The lower part of Mayanja wetland supports human activities including fishing (artisanal), fish farming (extensive) and hunting.

Within the upper part, west of the southern spur, the streams are highly channelled into small, shallow, blind-ended canals to water gardens and brick laying sites. Under the southern spur, the canals unite, and this results in ponding. To reduce the ponding effect and prevent flooding in the upper part of the wetland, the communities cleared two channels that are regularly maintained to facilitate flow of the stream (see Plate 2.1). Therefore, two sampling sites were selected along Mayanja (UTM 36N 0457060 E, 0026054 N) and Kaliddubi (UTM 36N 0456789 E, 0025992 N) within the lower part of the wetland, east of the southern spur.

Plate 2.1: Streams and the ponding effect in Mayanja Wetland (Munyonyo site); A – maintained Mayanja channel, B – maintained Kaliddubi channel, and C – ponding underneath the southern spur of the Kampala-Entebbe Expressway

Figure 2.1: Location of fish points in Mayanja Wetland

2.1.2 Fish Diversity

A total of 8 specimens belonging to the Cichlidae family and genera *Pseudocrenilabrus* and *Oreochromis* were caught. *Pseudocrenilabrus* were represented by *Pseudocrenilabrus multicolor*, while *Oreochromis* were represented by *Oreochromis leucostictus* (see Table 2.1and Plate 2.2: Pictures of fish species caught in Mayanja Wetland

All the specimens were caught along Mayanja by minor traps. At the time of the assessment, the channel of Kaliddubi stream had just been polluted with brown water – this could be the reason for fish absence.

Table 2.1: Fish species caught in Mayanja Wetland during December assessment

Species	Mayanja	Kaliddubi
Pseudocrenilabrus multicolor	2	-
Oreochromis leucostictus	6	-

a) *Pseudocrenilabrus multicolor*

b) *Oreochromis leucostictus*

Plate 2.2: Pictures of fish species caught in Mayanja Wetland

Based on consultations held with two part–time fishermen in Manyanja wetland, fishing is done on a small scale using artisanal methods (line, hook and baskets) and the common fish reported included *Clarias* spp. (possibly *Clarias gariepinus* and *Clarias alluaudi*) and *Protopterus aethiopicus*, in addition to the species recorded in the survey.

Additionally, fish farming is undertaken within the surroundings of Mayanja wetland. A rudimentary fish farm, consisting of dug-out ponds, was observed at UTM 36N 0456542, 0025972. The source of water for the dug-out ponds is a brook, west of the ponds, and fish are naturally stocked by the system. No supplementary feeding is provided to the fish. Fish species within the fish farm include *Oreochromis leucostictus, Pseudocrenilabrus multicolor, Protopterus aethiopicus* and *Clarias gariepinus.*

2.2 Kansanga Wetland

2.2.1 Habitat Conditions

For the purpose of this report, the Kansanga wetland included the stretch from Heritage Village to Tibaleka that will be traversed by the KSB. The area of wetland in Heritage Village is modified with rice paddies (Plate 2.3 and Figure 2.2). The area has several brooks (UTM 36N 457846E, 31290N) flowing southward towards the proposed road alignment. The brooks feed canals in rice paddies (UTM 36N, 457821E, 31240N)

Beyond the rice paddies lies a drainage channel (UTM 36N, 457911E, 31117N) carrying waste and storm water from the surrounding area, including effluent from the rice paddies, to Lake Victoria.

a) Rice paddy canal

b) Drainage channel

Plate 2.3: Aquatic habitats in Heritage Village area within Kansanga Wetland

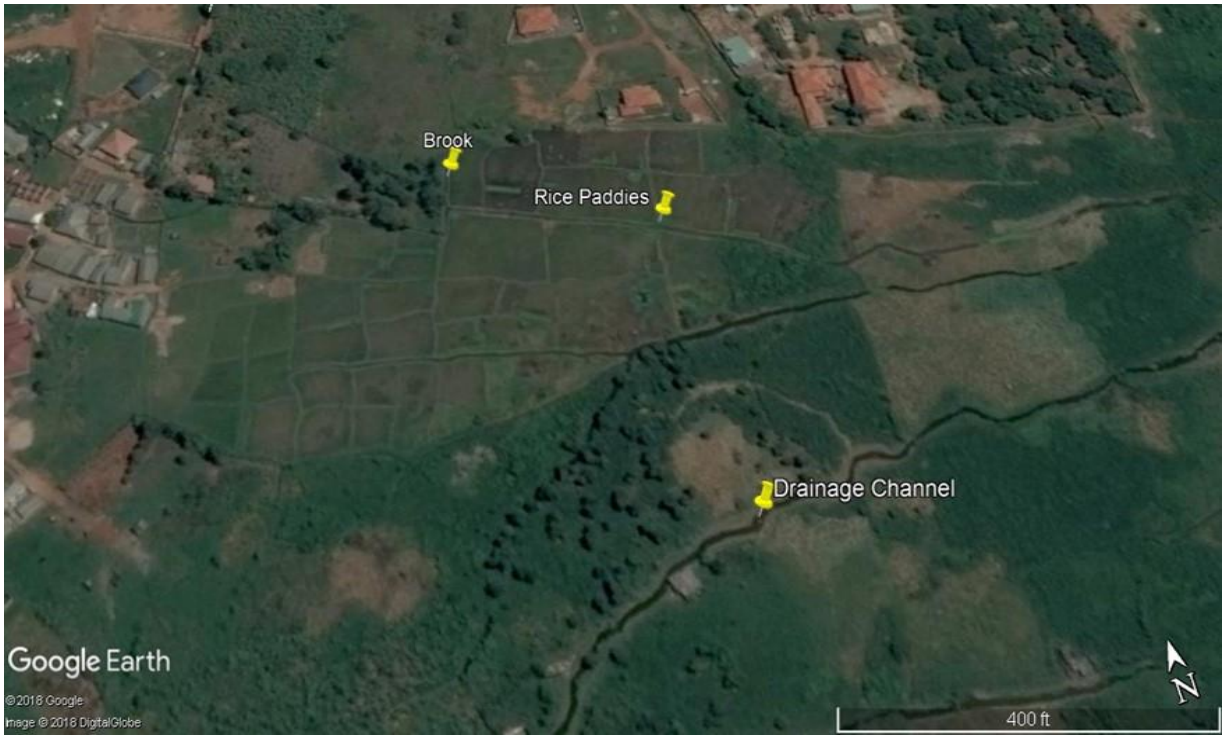

Figure 2.2: Locations of features of interest in Kansanga (Heritage Village area) Wetland

2.2.2 Fish Diversity

A total of 5 specimens of cichlids were caught from the rice paddy canal, belonging to the genera *Pseudocrenilabrus* and *Tilapia*. *Pseudocrenilabrus multicolor* represented *Pseudocrenilabrus* with four specimens, while *Tilapia* were represented by *Tilapia rendalli* with one specimen (Plate 2.4). There is no fishing within the Heritage Village area.

a) *Pseudocrenilabrus multicolor*

b) *Tilapia rendalli*

Plate 2.4: Fish species recorded in Kansanga (Heritage Village area) Wetland

2.3 Nakivubo (Bugolobi) Wetland

2.3.1 Habitat Conditions

Bugolobi is part of Nakivubo wetland, the biggest wetland in Kampala. The Bugolobi section is degraded with cocoyam and sugar cultivation (Plate 2.5) at the periphery and *Phragmites* grasses in the middle. At the time of the study, there was no water in the wetland except for a drainage channel, draining an upland built-up area. The survey point at UTM 36N 458787E, 0033628N was along this drainage channel.

a) Yam cultivation in the Bugolobi area with *Phragmites* grasses

b) Drainage canal

Plate 2.5: Habitats in the Bugolobi area of Nakivubo Wetland

2.3.2 Fish Diversity

The trap did not catch any fish. However, local children reported that fishing is done by boys between the ages of 8-13 years, and only small fish are caught including haplochromines, guppies, clarids and *Protopterus aethiopicus*.

2.4 Kinawataka Wetland

2.4.1 Habitat Conditions

Kinawataka wetland runs along the boundary between Nakawa Division (Kampala District) and Kira Town Council (Wakiso District) and is drained by five rivers. The wetland receives and purifies domestic and industrial effluents from Ntinda, Kyambogo, Nakawa and surrounding areas before reaching Lake Victoria (Opio *et al.,* 2011). Despite its recognised importance, it is targeted for industrial and infrastructure development (Government of Uganda, 2016). The wetland has been degraded by industrial and agricultural activities over the last four decades. The survey point was a marsh, along one of the rivers draining the wetland. The point was located within a sugarcane plantation at UTM 36N 0459220 E, 0037164N.

2.4.2 Fish Diversity

Interaction with locals revealed that fishing is done at subsistence level, mainly by teenagers using baskets and hooks. The species commonly caught include clarids (*Clarias gariepinus* and *Clarias alluaudi*) and *Protopterus aethiopicus*. Experimental fishing during the assessment studies yielded one specimen, *Protopterus aethiopicus* (Plate 2.6).

a) Investigation site and its surrounding

b) Fish specimen caught at the site

Plate 2.6: Investigation site and fish specimen in Kinawataka Wetland

2.5 Namanve Wetland

2.5.1 Habitat Conditions

Namanve wetland is located in Nama Sub County in Mukono district, stretching all the way to Lake Victoria. Part of the former Namanve Reserve was degazetted in 1997 to provide land for the Kampala Industrial Business Park (KIBP) by the Uganda Investment Authority (Government of Uganda, 2016). The KIBP houses factories, warehouses, distribution centers and other business offices.

The core of Namanve wetland is intact with typical wetland vegetation (Plate 2.7). Under the vegetation there was ankle-high to knee-high water as one moves eastward. In some areas the wetland floor was soft and mobile under the feet, with floating mat over a big volume of water (lotic or lentic). The wetland is a sink for storm water from its catchment, which drains into Lake Victoria.

a) Core Namanve Wetland

b) Knee-high water under vegetation

c) Flowing stream fringing the wetland to the east

Plate 2.7: Habitats of Namanve Wetland

2.5.2 Fish Diversity

Two investigation sites were selected; one along the roadside (at UTM 36N 0466371E, 0036731N) and the other under vegetation (at UTM 36N 0466308E, 0036746N).

A total of 22 specimens belonging to the Cichlidae and Clariidae families were recorded. Cichlidae was represented by two genera (*Pseudocrenilabrus* and *Oreochromis*) while Clariidae was represented by one genus (*Clarias*, Plate 2.8). The catch composition from the site under vegetation had higher diversity compared to the roadside site (see Table 2.2 below).

No fishing activities were reported during interaction with the locals. The key economic activities mentioned/observed in connection to the wetland were brick making, fish farming (UTM 36N 0464371E, 0036425N) and papyrus harvesting for crafts.

Table 2.2: Distribution of fish in Namanve Wetland

Family / Species	Flow along the road side (UTM 36N 0466371E, 0036731N)	Under vegetation (UTM 36N 0466308E, 0036746N)
Cichlidae		
Oreochromis leucostictus	4	9
Pseudocrenilabrus multicolor	1	3
Clariidae		
Clarias alluaudi		5
Total	**5**	**17**

a) *Clarias alluaudi*

b) *Oreochromis leucostictus*

c) *Oreochromis leucostictus* with eggs in the mouth

d) *Pseudocrenilabrus multicolor*

Plate 2.8: Fish caught in Namanve Wetland

2.6 Kasaala (Mbalala) Wetland

2.6.1 Habitat Conditions

The Kasaala (Mbalala) wetland investigation point was at UTM 36N 0480430E, 0038661N, along a permanent stream (Kasaala) that flows eastward and crosses Jinja Road at Mbalala Trading Centre. The investigation site was sheltered under a closed canopy (of vascular hydrophytes) with loose banks and an organic matter bed (Plate 2.9).

Plate 2.9: Investigation site in Mbalala Wetland

2.6.2 Fishing

Fishing activities are done at subsistence level using baskets and hooks, and spears (*Clarias*) during wet seasons. Species reported include cichlids (*Tilapia* or/and haplochromine cichlids), clirids (*Clarias gariepinus* and *Clarias alluaudi*) and *Protopterus aethiopicus*. Experimental fishing during this assessment yielded one specimen of *Clarias alluaudi* (Plate 2.10).

Plate 2.10: *Clarias alluaudi* caught from Kasaala (Mbalala) Wetland

2.7 Sezibwa River

2.7.1 Habitat Conditions

The Sezibwa River is the second major river in Mukono after the River Nile. Wetlands in the Mukono district occur around the Sezibwa and Nile rivers, and along the shores of Lake Victoria and Lake Kyoga. About 90 percent of Mukono district drains northwards, through the River Sezibwa, into Lake Kyoga.

The investigation sites were selected at UTM 0484815E, 0039983N (upstream) and UTM 36N 0484839E, 0040381N (downstream). The investigation site in the upstream reach had a channel width of about 3 m and depth of about 0.5 m. The site was sheltered under a canopy of vascular hydrophytes with in-stream emergent plants, and loose banks and clear water flowing at 0.2 m/s. While the site in the downstream reach was not sheltered, it had vegetated banks. Its depth was about 1 m and it had turbid water flowing at 0.1 m/s (see Plate 2.11: Investigation points along Sezibwa River

).

a) Upstream – UTM36N 0484815E, 0039983N

b) Downstream – UTM 36N 0484839E; 0040381N

Plate 2.11: Investigation points along Sezibwa River

2.7.2 Fish Diversity

Fishing is a recreational activity at Sezibwa Falls, using line and hook. Species reported include cichlids (*Tilapia* or/and haplochromine cichlids) and clirids (*Clarias gariepinus* and *Clarias alluaudi*). Experimental fishing carried out during this assessment yielded 18 specimens belonging to the Clariidae, Cyprinidae and Mormyridae families (Plate 2.12 and Table 2.3).

Table 2.3: Distribution of fish at the sampling points in River Sezibwa

Species	Upstream (UTM 0484815E, 0039983N)	Downstream (UTM 36N 0484839E; 0040381N)
Clariidae		
Clarias gariepinus	-	1
Cyprinidae		
Barbus bynni	-	4
Barbus neumayeri	2	9
Mormyridae		
Pollimyrus nigricans	-	2
Total	**2**	**17**

a) *Barbus bynni*

b) *Barbus neumayeri*

c) *Clarias gariepinus*

d) *Pollimyrus nigricans*

Plate 2.12: Photos of fish caught from Sezibwa River

3 HABITAT REQUIREMENTS AND CONSERVATION STATUS OF FISH FAUNA RECORDED IN THE PROJECT AREA

Barbus bynni feeds on crustaceans, insects, molluscs, ostracods, small algae, chironomid larvae and organic debris. Its annual spawning coincides with the onset of the floods. It is not a commercial fishery species, though it is harvested for human consumption. It is assessed as Least Concern (LC) by IUCN. However, its populations are threatened by habitat fragmentation, water pollution (agriculture, domestic and commercial/industrial), groundwater extraction and drought (Azeroual and Getahun, 2010).

Barbus neumayeri occurs in permanent and seasonal fast flowing streams. It is a small opportunistic feeder with an omnivorous diet including plant matter, detritus, insects and other invertebrates. Its peak spawning times is wet seasons. The species is assessed as Least Concern (LC) by IUCN, though its populations are threatened by regression of swamps and wetlands around rivers and lakes due to agriculture.

Clarias alluaudi occurs in rivers, streams, swamps and lakes. Around Lake Victoria, it is found in areas with marginal macrophytes and papyrus swamps. It feeds on a wide range of insect larvae and crustaceans, and sometimes on small fish. It is harvested for human consumption. According to IUCN, the conservation status is Least Concern (LC). However, it is threatened by regression of swamps and wetlands around rivers and lakes, and by sedimentation and pollution (FishBase RMCA team and Geelhand, 2016).

Clarias gariepinus lives and feeds from the bottom to near-surface. The species is of major economic importance in capture fishery as well as in aquaculture. There are no known threats to this species (Freyhof *et al*., 2016), and its IUCN conservation status is Least Concern (LC): (http://www.iucnredlist.org/details/166023/0).

Oreochromis leucostictus is a lagoon specialist. It tolerates fluctuating physical conditions, low oxygen conditions and high temperatures. It prefers shallow (0-10 m depth) vegetated channels and lagoons, near papyrus fringes. It feeds on phytoplankton, algae and bottom deposits. It is a mouth brooder and its spawning is probably triggered by the onset of rains. No serious threats have been identified for this species (Ntakimazi *et al.,* 2006) and its IUCN conservation status is Least Concern (LC) (http://www.iucnredlist.org/details/60627/0).

Pollimyrus nigricans lives in shallow and muddy bottom waters near fringing vegetation such as papyrus and *Vossia* grasses. It feeds on aquatic insects, mainly chironomid larvae, *Caridina* and *Caenidae* larvae, and algae and plankton. It breeds continuously throughout the year with obvious peaks during the rains. It migrates up the rivers to spawn in temporary pools and streams. *Pollimyrus nigrican* is of Least Concern according to IUCN, although it is threatened by introduced fish species and loss of *Papyrus* swamps and other vegetated wetlands around rivers and lakes (http://www.iucnredlist.org/details/60350/0).

Protopterus aethiopicus inhabits river and lake fringes, swamps and flood plains. It prefers dense swamps and marshes. Juvelines are found in matted papyrus roots. It breeds during wet seasons. It feeds on molluscs, small fish and insects. The fish is an important food fish. The species is threatened by large-scale conversion of wetland, sedimentation and agrochemical use (FishBase team RMCA *et al.,* 2016). The species is classified as Least Concern by the IUCN (http://www.iucnredlist.org/details/183073/0).

Pseudocrenilabrus multicolor occurs among submerged plants and in open water zones enclosed by papyrus swamps. It is assessed as Least Concern (LC). Degradation and modification of swamps through agriculture and human settlement threaten the species in those habitats. A particular threat is sedimentation as a result of soil erosion (http://www.iucnredlist.org/details/60664/0).

Tilapia rendalli lives near the bottom and prefers quiet and well-vegetated water. It is assessed as Least Concerned (LC) by IUCN. Major threats to this fish include loss of vegetated margins and floodplains around rivers (http://www.iucnredlist.org/details/60690/0).

Exotic and invasive species

Exotic and invasive species are both non-native species. For the purpose of this report, exotic species refer to organisms introduced into areas outside their natural distribution and cause no harm to the biological diversity. While invasive species refers to those introduced outside natural distribution and threaten native biological diversity.

All the fish species recorded in the aquatic systems along the KJE Phase I alignment during the wet season were native to Uganda and no invasive except for *Tilapia rendaii*. *T. rendaii* is a herbivorous species feeding on algae and high plant material. It was introduced to Uganda for aquaculture stocking, and algae and weed control in aquaculture production systems (ponds) (Awaiss *et al.,* 2010).

Conservation Concern

According to the literature review and field investigations, no fish species of conservation concern were recorded or reported within the project area. However, project activities pose threats to their habitat and they may require special consideration during project design, planning and implementation. The major threats to these fish include wetland regression and vegetation loss, wetland conversion, pollution, and introduction of non-native species. The major drivers of these threats include agriculture, settlement and infrastructure development.

The lifecycle (construction and operation phases) of the proposed KJE road infrastructure is envisaged to involve the following activities:

a) Reclaiming or draining wetland;
b) Erecting, constructing, and placing structures in, under, or over wetland;
c) Drilling or tunnelling wetland;
d) Depositing substances in, on, or under wetland;
e) Otherwise destroying, damaging or disturbing a wetland in a manner likely to have an adverse effect on plants, animals or their habitat;
f) Possibility of introducing exotic plants or animals in wetlands; and
g) Removing soil or burning wetland resources, as listed under the National Environment (Wetlands; River Banks and Lake Shores Management) Regulations, 2000.

The aforementioned activities pose great risk to the survival of the identified fish species and, as such, measures ought to be taken to conserve the existing fish species within the project area.

4 POTENTIAL PROJECT IMPACTS ON AQUATIC LIFE AND MITIGATION MEASURES

4.1 Introduction

Following desk studies, site investigations, interaction with locals and experts, and envisaged project activities, potential impacts on aquatic resources are identified and some mitigation measures are suggested.

4.1.1 Negative impacts during construction phase

The construction phase of the project will involve creation of infrastructure foundations and anchorages, creation of road surface, construction of road drainage facilities, and other road accessories. These will require clearing vegetation, wetland excavations and dredging.

4.1.1.1 Effects of habitat loss

Fish use wetlands for breeding, feeding and shelter. The creation of road and associated infrastructure will require wetland vegetation clearing, and consumption/depletion of wetland area. Vegetation clearing and wetland depletion cause loss of fish habitat (refugial and breeding areas) and exposes the wetland to colonization by invasive species. These are negative impacts, partly irreversible, and anticipated to occur throughout the construction and operation phases.

Impact Significance

The likelihood of the impact occurring is ***medium*** since four of seven wetlands lack wetland vegetation, along the proposed road alignment. The impact severity is assessed as ***medium*** and thus considered to be of ***moderate*** significance.

Mitigation Strategies

- Minimize the project footprint by restricting vegetation clearance to critical infrastructure dimensions;
- Construction activities should not exceed the proposed construction boundaries by more than 10 m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation;
- Stockpile the topsoil layer separately and return it when construction is complete to allow rapid re-establishment of wetland vegetation in temporarily cleared patches; and
- Continuously monitor and remove alien plants.

4.1.1.2 Effects of wetland disturbance or introduction of sediments

Installation of infrastructure will require excavation and dredging of the wetland surface, and erection of viaducts or filling of wetland. Wetland excavation, earth movements, erection of viaducts or filling in wetlands will increase turbidity downstream. The lifecycle, food web and ecological strategies of fish will

be disrupted by increases in suspended particulates and dredging. High turbidity causes reduced primary and secondary production, while visual impairment reduces the escape ability, food recognition and hunting efficiency of fish and other organisms. In addition, filling of wetlands will change the hydrology of the system, likely resulting in ponding, which may favor invasion of opportunistic fish species. These are negative impacts but reversible and anticipated to occur throughout the construction phase.

Impact Significance

The likelihood of the impact occurring is ***high*** because there is no existing road for most of the proposed road alignment. The impact severity is assessed as ***medium*** and considered to be of ***moderate*** significance.

Mitigation Strategies

- Restrict wetland bed disturbance to critical sites;
- Sediment mobilization can be prevented using silt traps;
- Use designs and mechanisms that minimize introduction of sediment; and
- Use of pillars (stilts) at river and wetland crossings as opposed to culverts and filling, to allow for hydrological continuity.

4.1.2 Negative impacts during operation phase

4.1.2.1 Habitat fragmentation

The proposed road will cut through aquatic resources (wetlands and streams) to create fragmentation which is of less ecological value than the initial whole. Ecosystems, including wetlands, are characterised by complex, interdependent relationships between component species and their physical environment, and the integrity of the ecosystem relies on the maintenance of those interactions. In addition, fish move between aquatic resources, including wetlands, for spawning and feeding. By cutting through a wetland, the road will affect the wetlands' stability, health, and fish movements. This will make wetlands more vulnerable to invasions and degradation and affect fish diversity. These are negative impacts, but reversible and anticipated to occur throughout the operation phase.

Impact Significance

The likelihood of the impact occurring ***high*** because the proposed alignment is planned to traverse multiple wetlands. The impact severity is assessed as ***high*** and considered to be of ***major*** significance.

The impact significance will be ***moderate*** where viaducts are used.

Mitigation Strategies

- Design and plan to allow continuity of interactions within and between component species and their physical environment;
- Install viaducts where the road passes through the core of wetlands; and
- Minimize positioning of road interchanges/junctions within wetlands to limit human interaction with wetland.

5 IMPACTS MANAGEMENT AND MONITORING PLAN

Project impact and aspect	Cause of the impact	Mitigation strategies	Performance indicators	Implementation timeframe	Responsible party	Monitoring party	Monitoring means & frequency
Construction Phase							
Habitat loss	Infrastructure will require vegetation clearing and consumption of wetland surface.	• Minimize project footprint by restricting vegetation clearing to critical infrastructure dimensions; • Construction activities should not exceed the proposed construction boundaries by more than 10 m • Stockpile topsoil layer should be separated and reinstated after construction to allow rapid re-establishment of wetland vegetation in temporarily cleared patches; and • Monitor and remove alien plants.	Cleared area beyond infrastructure footprint Presence of alien's species	Quarterly throughout the construction phase	Contractor	UNRA/NEMA	Reviewing monitoring reports and physical inspection
Wetland disturbance or introduction of sediments	Excavation and dredging of wetland surface, and erection of viaducts and/or filling of wetlands.	• Restrict wetland bed disturbance; • Sediment mobilization can be prevented using silt traps; • Use designs and mechanisms that minimize introduction of sediment; and • Use of pillars (stilts) at river and wetland crossings as opposed to	Wetland filling	Throughout the construction phase	Contractor	UNRA/NEMA	Physical inspection

		culverts and filling to allow hydrological continuity.					
Operation Phase							
Habitat fragmentation	Road cutting through aquatic resources (wetlands and streams), interrupting hydrology and fish movements.	• Design and plan to allow continuity of interactions within and between component species and their physical environment; • Install viaducts where the road passes through the core of wetlands; and • Minimize positioning of interchanges / junctions within wetlands to reduce human interaction with wetland.	Development of barriers within the aquatic ecosystem Change in fish species composition	Annually throughout the operation phase	UNRA	UNRA/NEMA	Physical inspection and review of records

6 CONCLUSION AND RECOMMENDATIONS

The literature review and survey indicated that the aquatic habitats of this area are under threat. However, they retain some capacity to perform important ecological functions and services, including providing water and other material, and attenuating floods.

The study also showed that the aquatic habitats do not have any identified fish species of special conservation concern, in terms of their distribution (endemism) and populations. However, habitats need to be conserved through sustainable development, to continue supporting the current flora and fauna biodiversity. This includes conservation of hydrological and physical (water quality and vegetation) conditions.

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AVIFAUNA ASSESSMENT KAMPALA-JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

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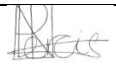
Author	**Percis Irene Namukasa**	**Ornithologist**		**19/03/2018**	**3**
Reviewer (s)	**Denis Kyongera**	**ESIA Coordinator**		**3/04/2018**	**4**
Approver	**Edgar Mugisha**	**ESIA Team Leader**		**24/04/2018**	**5**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

WET SEASON AVIFAUNA ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

1 INTRODUCTION

Nationwide, Uganda holds at least 1057 confirmed bird species (Carswell *et al*. 2005, Nature Uganda 2012). Uganda has 24 of globally threatened species and 29 Near-threatened species with the rest of the species being of least concern (Birdlife International 2014). The globally threatened species include 9 endangered species and 25 vulnerable species. The Endangered species include the country's national bird. The Grey-Crowned Crane and three of the vulture species in Uganda; White-backed Vulture, Ruppell's Vulture and Hooded Vulture. On regional level, 73 species are regionally- threatened while 118 are either Near-threatened or of regional responsibility (Bennun and Njoroge 1996). Among the country list of species, about 236 are regular migrants including those from the Palearctic region (137) and the intra-African migrant (54). The majority of birds in Uganda (846) are resident species and breed in the country (Nature Uganda, 2014).

The purpose of this study is to assess the diversity of birds along the Phase 1 alignment as part of the ESIA for the Kampala – Jinja Expressway PPP Project.

1.1 Birds as biodiversity indicators

Birds are good indicators of general biodiversity, in that areas very rich in bird species have been found to also be rich in other species. Birds are useful as bio-indicators because they are:

- Wide spread and occur in all habitats (forest, grassland, water, cultivation),
- Relatively large and conspicuous, and therefore easily surveyed with simple methods like observation and use of calls to record presence or absence,
- Mostly active during the day (compared to many mammals and amphibians),
- Often specialized in their habitats, e.g. forest or water specialist. The disappearance of such specialist species in an ecosystem can be used to assess the health of that ecosystem or the extent of degradation.

1.2 Conservation value of birds

Given the significance of birds for conservation planning and environmental assessments, there is a need for a better ecological understanding of the role of avian community structure in conservation decision-making. Bird diversity is widely used in conservation and population trends monitoring in farmlands. Birds are one of the 15 'Quality of Life' indicators. In addition, small land birds in particular can potentially be used as indicators for the presence of other unrelated taxa or as indicators of environmental change, to be integrated into broader monitoring schemes. Furthermore, birds are frequently included in evaluation studies for overall biodiversity conservation (Gregory et al. 2004; Kati and Sekercioğlu 2006).

2 METHODOLOGY

2.1 Survey Area

The survey area comprised the proposed Kampala Jinja Expressway (KJE) Phase 1 area of influence, which traverses the districts of Kampala, Mukono, and Buikwe. The proposed expressway route will traverse a series of mosaic semi-natural habitats like wetlands (Mayanja wetland, Kansanga wetland, Navikubo wetland, Kinawataka, and Namanve wetland) and riverine forest (Sezibwa forest), as well as cultivations alongside settlements and fallow lands. Sampling points were selected to represent wetlands, cultivations, settlements and streams. See survey point details in Appendix 1.

2.2 Field Survey Schedule

The avifauna survey was conducted between 19th and 23rd December 2017 (Table 1.1). This was the end of the wet season in Central Uganda. From an ornithological standpoint, the visit covered the end of the period of the southward passage (mainly September to November), as well as the period for winter visitors (mainly October to March, so in December they were well established). Transect survey sites were chosen to represent all the main vegetation types in the project area. They were selected during a reconnaissance visit undertaken in June 2017.

Table 2.1 Periods of avifauna surveys in the transect sites

Survey Site	Period of Avifauna survey	Date of the Survey
Mayanja wetland (Munyonyo site)	Early morning and evening	19/12/2017
Kansanga wetland (Heritage site)	Early morning	20/12/2017
Kansanga wetland (Bukasa site)	Late morning and afternoon	20/12/2017
Nakivubo Wetland (Bugolobi site)	Evening	20/12/2017
Namanve wetland	Early morning and late evening	21/12/2017
Kinawataka wetland (Kinawataka site)	Evening	21/12/2017
Kasala wetland (Mbalala site)	Early morning	22/12/2017
Sezibwa Forest and Wetland	Evening	22/12/2017
Sezibwa Forest and Wetland	Early morning	23/12/2017
Agricultural land (cultivations along KJE alignment)	Morning and evening	23/12/2017

2.3 Avifauna Survey methods

2.3.1 Timed Species Counts

Timed Species Counts (TSCs) were used to assess the relative abundance of birds within the survey sites a method that gives the researcher the opportunity to flush out all observable species. TSCs are good for quick assessment of species richness and abundance of an area and are thus good for inventorying areas in environmental assessments (Pomeroy & Dranzoa, 1997; Freeman et al, 2003).

This method involved developing a species list in which all species positively identified earlier within the allocated sampling hour were assigned a higher score, under the assumption that most abundant species would be identified sooner than scarce ones. The species recorded between 0-10,10-20,20-30, 30-40, 40-50, 50-60 minutes were given scores of 6, 5, 4, 3, 2 and 1 respectively (Pomeroy 1992). Unrecorded species were ranked 0.

Birds were recorded at any distance as long as they were in or above the habitat being sampled. Counts were made at various times of day. Whenever possible, counts at each survey site were made at different times, to account for different activity patterns; for example, many birds are most active early in the morning, but large raptors and some aerial species become active later when the air is warmer.

The TSCs were supplemented with opportunistic observations; for example, if a bird was seen before or after making a transect count, and in the same habitat, then it was recorded as present. An interview was also conducted with a tourist guide at Sezibwa forest to identify local bird species and those of interest to tourists.

GPS coordinates were recorded to precisely georeferenced the survey sites (Appendix 1).

Occasional reference was made to the Stevenson and Fanshawe (2002) field guide to identify birds.

In order to simplify data and to produce a meaningful pattern, birds were further categorised using IUCN criteria as outlined in Table 1.2 below.

Table 2.2 Categories of birds according to their IUCN status and habitat requirements

Category	Description	Abbreviation
Forest	➢ Forest specialists ➢ Cannot survive outside the primary forest	FF
	➢ Forest generalists. ➢ They can live in the forest and at the forest edge or a degraded forest	F
	➢ Don't live in the forest ➢ They come to the forest as 'visitors'	f
Water	➢ Species restricted to wetlands/open waters ➢ They cannot survive outside an aquatic environment	W
	➢ Non-specialist water birds often found near water ➢ Facultative water birds	w
Grassland & Agricultural Cultivation	➢ They live in grassland habitats ➢ They are generally widely spread in all habitats but tend to avoid forests ➢ They are species that can be found in cultivated areas like gardens, fallow lands and settlements	NF
Least Concern	➢ Bird species that are listed to be of least concern according to the IUCN red list of threatened species	LC
Vulnerable	➢ Bird species whose populations are listed to be of vulnerability according to the IUCN red list of threatened species	VU
Near threatened	➢ Bird species that are listed to be nearly threatened numbers according to the IUCN red list of threatened species	NT

Category	Description	Abbreviation
Endangered	➢ Bird species that are listed to be endangered in numbers according to the IUCN red list of threatened species	EN
Globally critical	➢ Bird species whose populations are listed to be globally critical according to the IUCN red list of threatened species	G-CR
Regionally critical	➢ Bird species whose populations are listed to be regionally critical according to the IUCN red list of threatened species	R-CR
Globally vulnerable	➢ Bird species whose populations are listed to be globally vulnerable according to the IUCN red list of threatened species	G-VU
Regionally vulnerable	➢ Bird species whose populations are listed to be regionally vulnerable according to the IUCN red list of threatened species	R-VU
Globally lower-risk, near threatened	➢ Bird species that are listed to be globally lower-risk, near threatened according to the Bird Atlas of Uganda	G-LR/nt
Regionally Near threatened	➢ Bird species that are listed to be regionally near threatened according to the Bird Atlas of Uganda	R-NT
Globally Endangered	➢ Bird species that are listed to be globally endangered in numbers according to the Bird Atlas of Uganda	G-EN
Regionally Endangered	➢ Bird species that are listed to be regionally endangered in numbers according to the Bird Atlas of Uganda	R-EN
Globally range-restricted	➢ Bird species that are listed to be globally range-restricted according to the Bird Atlas of Uganda	G-RR
Species of regional responsibility	➢ Bird species that are listed to be of regional responsibility according to the Bird Atlas of Uganda	R-RR
Breeding	➢ Occasional breeder	OB
	➢ Resident breeder (Species that are residents and breed from within their permanent locality)	RB
	➢ Resident, breeding not proved but likely	R(B)
	➢ Former breeder	FB
Migrant Species	➢ Migrant breeder	MB
	➢ Migrant, breeding not proved (but likely)	M(B)
	➢ Intra-African migrant, breeding	AfM/B
	➢ Intra-African migrant, breeding not proved (but likely)	AfM/(B)
	➢ Intra-African Migrant, not breeding	AfM/NB
	➢ Regular passage migrant	PM
	➢ Regular Winter Visitor	WV
	➢ Resident non-breeder	RN
	➢ Occasional Winter Visitor	OW

Category	Description	Abbreviation
	➢ Accidental Visitor or vagrant	AV
Introduced species	➢ These are species that are not indigenous to Africa(Uganda) but were just introduced	I
Not Evaluated	➢ Bird species whose population status has not yet been evaluated.	NE

3 RESULTS OF AVIFAUNA SURVEYS

The numbers of individuals and species observed in each survey site are shown in Table 2.1. Overall, the avifauna species diversity for all the sites was low. The site in Sezibwa Forest registered the highest species diversity due to its heterogeneous (riverine forest fringed by farmed lands and settlements) home range. The site at Kinawataka Wetland registered the lowest species diversity as shown in Figure 2.1. This is due to the high extent of habitat degradation in Kinawataka Wetland.

Table 3.1: Avifauna species richness for the surveyed sites

Survey Site	Number of Individuals Observed	Number of Species Represented.
Mayanja Wetland (Munyonyo site)	140	31
Kansanga Wetland (Bukasa site)	30	12
Nakivubo Wetland (Bugolobi site)	21	11
Kansanga Wetland (Heritage site)	60	15
Kinawataka Wetland	35	10
Namanve Wetland	119	33
Kasaala (Mbalala) Wetland	94	21
Sezibwa Forest	201	49
Cultivations	111	18

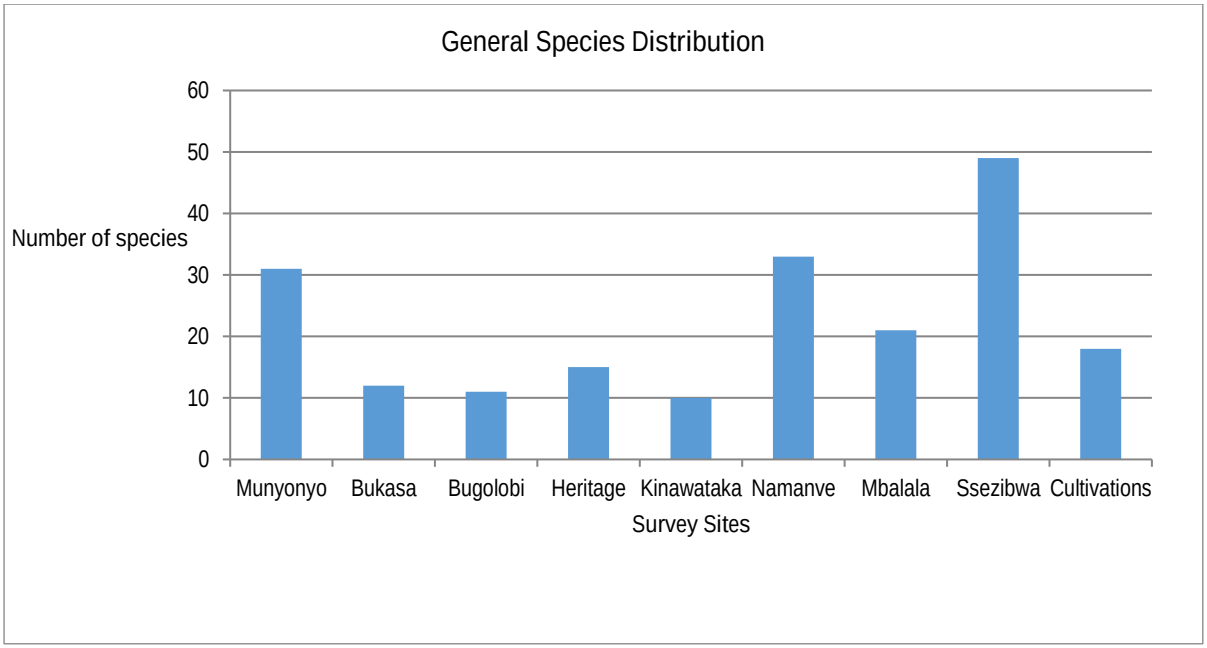


Figure 3.1 Avifauna species diversity according to the survey sites

3.1 Distribution of avifauna species by survey site

3.1.1 Mayanja Wetland (Munyonyo Survey Site)

The most abundant and widely distributed species in this site was the Black-headed Weaver (*Ploceus melanocephalus*) which accounted for 13% of the sightings recorded in this study, followed by the Little Swift (*Apus affinis*) at 10% as presented in Figure 2.2.

Two forest visitors (the African Harrier-Hawk, *Polyboroides typus* and the Black-and-white Mannikin, *Spermestes bicolor*) and two true water specialists (the African Jacana, *Actophilornis africanus* and the Long-tailed Cormorant, *Phalacrocorax africanus*) were observed. Eight non-water specialist water birds (species often found by water) were also identified.

Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2). The Grey Crowned-Crane (*Balearica regulorum*) and the Grey Heron (*Ardea cinerea*) are listed as regionally near threatened according to The Bird Atlas of Uganda *(*Carswell *et al*. 2007).

The Grey Crowned-Crane (*Balearica regulorum*) is listed as Endangered according to the IUCN red list of threatened species 2013. Despite being the national bird for Uganda and flying high on the national flag, the population of the Grey Crown Crane has plummeted by 80% since the 1970s. Its population has drastically reduced from more than 35,000 birds of the 1990s to less than 13,000 individuals per estimates of 2010 (Nature Uganda 2014). The trend is reminiscent of the status of the seasonal flooded wetlands, the main habitat for the species. Its habitat is seriously degraded and quickly disappearing. Surveys show that cranes are also threatened by illegal trade, use in witchcraft and domestication (Nature Uganda 2014).

Most of the observed species were resident breeders except the Black Kite *Milvus migrans* being a resident breeder and regular passage migrant, the Grey Crowned-Crane, *Balearica regulorum* a resident breeder and an intra-African migrant but nonbreeding, Grey Heron *Ardea cinerea* a resident breeder, former

breeder as well as an occasional winter visitor, Marabou Stork-*Leptoptilos crumeniferus* a resident breeder as well as an intra-African migrant breeder and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

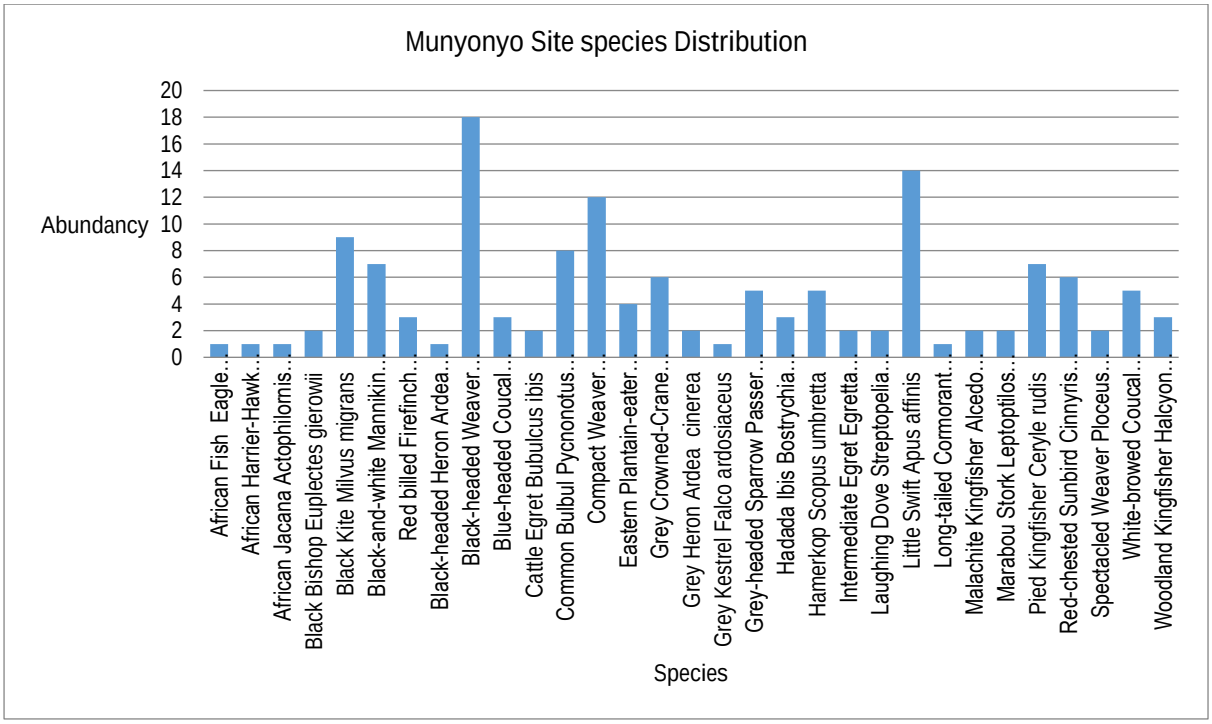


Figure 3.2: Number of species per taxa recorded at Munyonyo survey site

3.1.2 Kansanga Wetland (Bukasa Site)

The most abundant and widely distributed species in this habitat was the Little Swift (*Apus affinis*) which accounted for 20% of the species recorded, followed by the Compact Weaver (*Pachyphantes superciliosus*) at 17% as presented in Figure 2.3.

One forest visitor (Common Bulbul, *Pycnonotus barbatus*) and one water specialist (Pied Kingfisher, *Ceryle rudis*) as well as two non-water birds were also observed.

Most of the species observed were those that are referred to as habitat generalists (NF) (Table 1.2 and Appendix 2). The Grey Heron (*Ardea cinerea*) is listed as Regionally Near Threatened according to the *The Bird Atlas of Uganda (*Carswell et al. 2007). No birds of international conservation concern were recorded in this site.

Most of the observed species were resident breeders except the Black Kite *Milvus migrans* being a resident breeder and regular passage migrant, the Grey Heron *Ardea cinerea* a resident breeder, former breeder as well as an occasional winter visitor, Marabou Stork *Leptoptilos crumeniferus* a resident breeder as well as an intra-African migrant breeder.

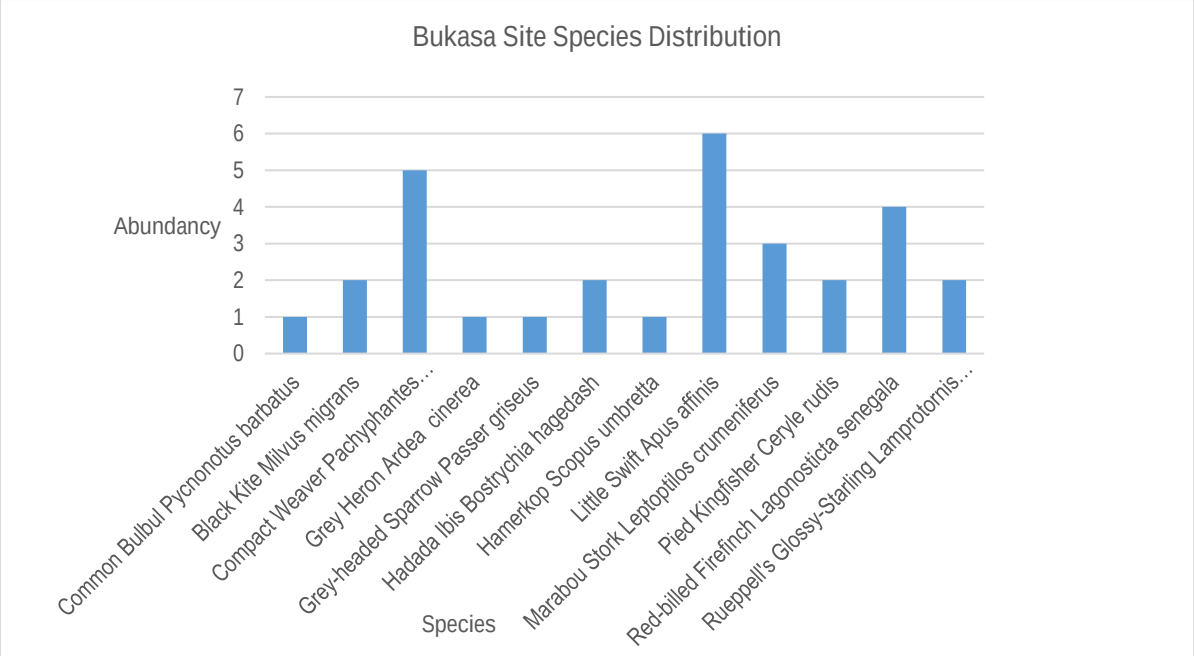


Figure 3.3: Number of species per taxa recorded at Kansanga wetland (Bukasa site)

3.1.3 Nakivubo Wetland (Bugolobi Site)

The most abundant and widely distributed species in this site was the Cattle Egret (*Bubulcus ibis*) which represented 25% of all the species recorded here; followed by the Marabou Stork (*Leptoptilos crumeniferus*) at 20% (Figure 2.4).

A forest visitor; the Green-backed Camaroptera (*Camaroptera brachyura*) and two forest generalists, Red bellied Paradise-Flycatcher (*Terpsiphone rufiventer*) and Ring-necked Dove (*Streptopelia capicola*) were observed here. Only one water specialist; Long-tailed Cormorant (*Phalacrocorax africanus*) was observed. One non-water specialist Common Sandpiper (*Actitis hypoleucos*), a non-water specialist water bird, often found by water was also observed.

Most of the species observed were those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2). No birds of international conservation concern were recorded here.

Most of the observed species were resident breeders except the Common Sandpiper *Actitis hypoleucos* being a winter visitor and an intra-African breeder, the Marabou Stork *Leptoptilos crumeniferus* a resident breeder as well as an intra-African migrant breeder and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

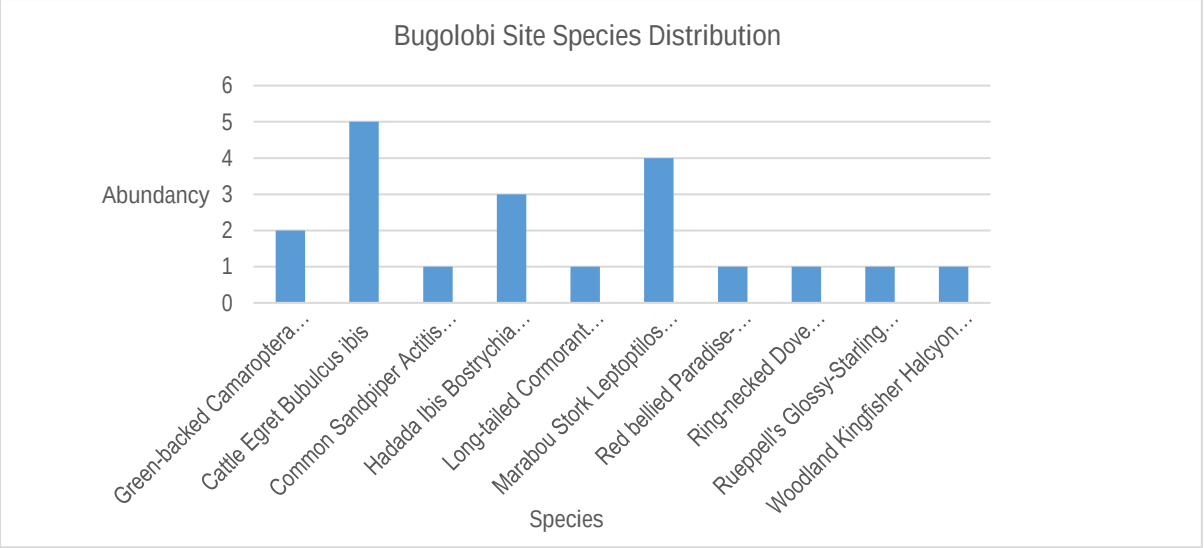


Figure 3.4: Number of species per taxa recorded at Nakivubo Wetland (Bugolobi site)

3.1.4 Kansanga Wetland (Heritage Site)

The most abundant and widely distributed species was the Speckled Pigeon (*Columba guinea*) at 17% of all species registered for this site, followed by the Marabou Stork (*Leptoptilos crumeniferus*) at 13%; refer to Figure 2.5.

Two forest visitors, the Broad-billed Roller (*Eurystomus glaucurus*) and the Common Bulbul (*Pycnonotus barbatus*), were recorded while no water specialists were observed, two non-water specialist African Open-bill (*Anastomus lamelligerus*) and Little Egret (*Egretta garzetta*) that is usually found next to water but can as well survive where there is no water were also recorded.

Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2).

The Grey Crowned-Crane (*Balearica regulorum*) was regionally listed as Regionally Near threatened according to The Bird Atlas of Uganda *(*Carswell *et al.* 2007). . The Grey Crowned-Crane (*Balearica regulorum*) is listed as Endangered according to the IUCN red list of threatened species 2013.

Most of the observed species were resident breeders except the Black Kite Milvus migrans being a resident breeder and regular passage migrant, the African Openbill *Anastomus lamelligerus,* Broad-billed Roller *Eurystomus glaucurus* and the Grey Crowned-Crane *Balearica regulorum* are resident breeders and an intra-African migrant but non breeding and the Marabou Stork *Leptoptilos crumeniferus* a resident breeder as well as an intra-African migrant breeder.

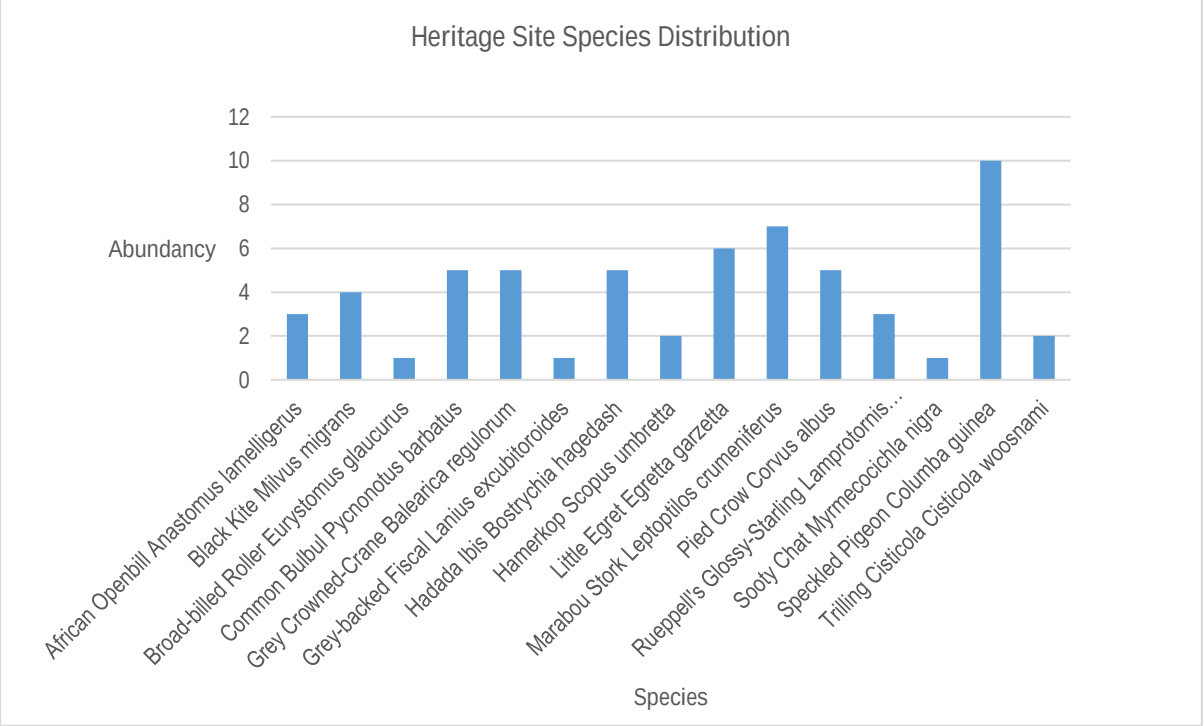


Figure 3.5: Number of species per taxa recorded at Heritage site

3.1.5 Kinawataka Wetland (Kinawataka Site)

The most abundant and widely distributed species was the Pied Crow (*Corvus albus*) at 26% of all the species recorded here, followed by the Marabou Stork (*Leptoptilos crumeniferus*) at 20% and Little Swift (*Apus affinis*) at 20% (Figure 2.6).

One forest generalist, the Red-eyed Dove (*Streptopelia semitorquata*) was observed. No water specialists were observed. Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2). No species of special and international conservation concern were recorded.

Most of the observed species were resident breeders except the Marabou Stork *Leptoptilos crumeniferus* a resident breeder as well as an intra-African migrant breeder and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

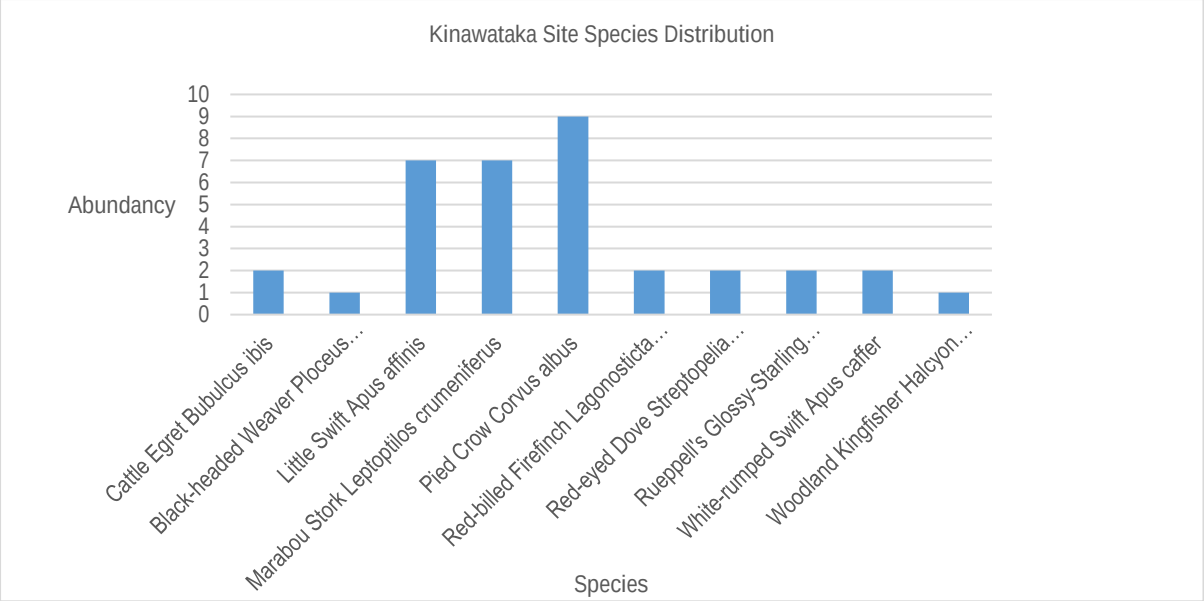


Figure 3.6: Number of species per taxa recorded at Kinawataka Wetland survey site

3.1.6 Namanve Wetland

The most abundant and widely distributed species was the Common Bulbul (*Pycnonotus barbatus*), comprising 13% of all the species recorded; followed by the Red eyed Dove (*Streptopelia semitorquata*) at 7% (Figure 2.7).

Forest visitors recorded included Black-and-white Mannikin (*Spermestes bicolor*), Greater Blue-eared Glossy-Starling (*Lamprotornis chalybaeus*), Green-backed Camaroptera (*Camaroptera brachyura*) and the Common Bulbul (*Pycnonotus barbatus*).

Forest generalists recorded included the Ring-necked Dove (*Streptopelia capicola*), Red-eyed Dove (*Streptopelia semitorquata*), Red-chested Sunbird (*Cinnyris erythrocerca*), Great Blue Turaco (*Corythaeola cristata*) and the Beautiful Sunbird (*Cinnyris pulchellus*). No water specialists were observed.

Non-water specialists observed included the Blue-headed Coucal (*Centropus monachus*), African Open bill (*Anastomus lamelligerus*) and African Marsh–Harrier (*Circus ranivorus*). Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2).

Regionally Near Threatened species observed included the Grey Crowned-Crane (*Balearica regulorum*) and the African Marsh-Harrier (*Circus ranivorus*). The Grey Crowned-Crane (*Balearica regulorum*) is listed as Endangered according to the IUCN red list of threatened species 2013.

Most of the observed species were resident breeders except the African Open bill *Anastomus lamelligerus,* Broad-billed Roller *Eurystomus glaucurus* and the Grey Crowned-Crane *Balearica regulorum* are resident breeders and an intra-African migrants but nonbreeding, the Eastern Olivaceous Warbler *Hippolais pallida* a winter visitor, the Greater Blue-eared Glossy-Starling *Lamprotornis chalybaeus* a resident but breeding not proven but likely, the Grey Crowned-Crane Balearica regulorum a resident breeder and an intra-African migrant but nonbreeding, Isabelline Shrike *Lanius isabellinus* a regular winter visitor and a passage migrant, White-throated Bee-eater *Merops albicollis* an intra-African migrant but non-breeding, a former breeder as well as a regular passage migrant, the Willow Warbler *Phylloscopus trochilus* a winter visitor and a regular passage migrant and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

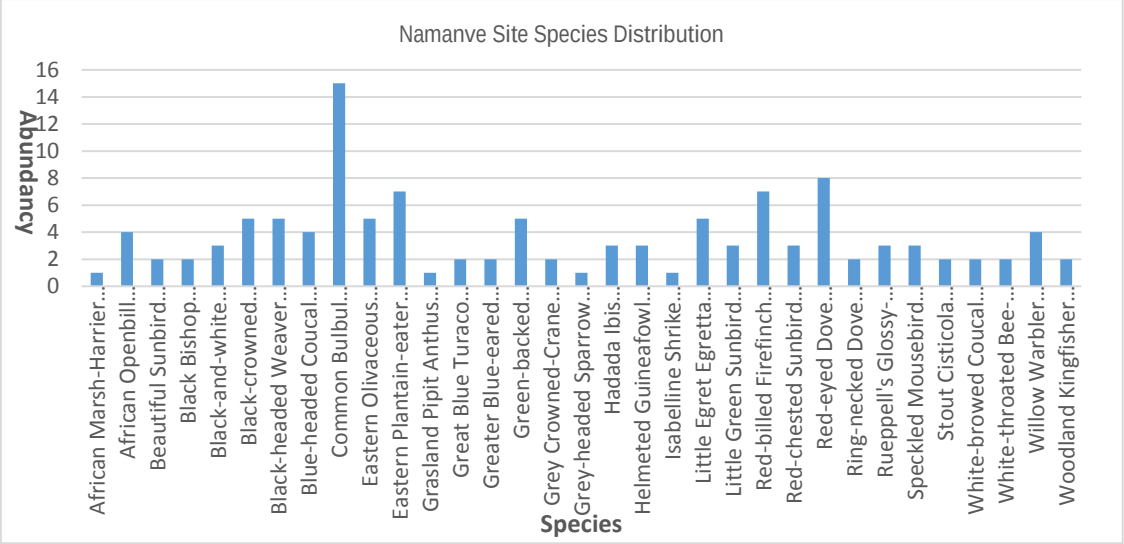


Figure 3.7: Number of species per taxa recorded at Namanve site

3.1.7 Kasaala Wetland (Mbalala Site)

The most abundant and widely distributed species was the Black and White Mannikin (*Spermestes bicolor*) comprising 37% of the species recorded, followed by the Common Bulbul (*Pycnonotus barbatus*) at 10% (figure 2.8).

Forest visitors recorded included: Black and White Mannikin *(Spermestes bicolor*) and Common Bulbul (*Pycnonotus barbatus)*, while forest generalists observed included Cinnamon-chested Bee-eater (*Merops oreobates*), Great Blue Turaco (*Corythaeola cristata*), Grey Parrot (*Psittacus erithacus*) and the Red-eyed Dove(Streptopelia *semitorquata*).

Non-water specialists included the Compact Weaver (*Pachyphantes superciliosus*) and Yellow-crowned Bishop (*Euplectes afer*).

Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2).

The Grey Parrot (*Psittacus erithacus)* is listed as Globally Vulnerable according to the IUCN red list of threatened species and Regionally Near Threatened according to The Bird Atlas of Uganda (Carswell *et al*. 2007).

Most of the observed species were resident breeders except the Red-chested Cuckoo *Cuculus solitaries* a resident breeder and an intra-African migrant but nonbreeding, the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder and the Yellow-crowned Bishop *Euplectes afer* a resident but breeding not yet proved but likely.

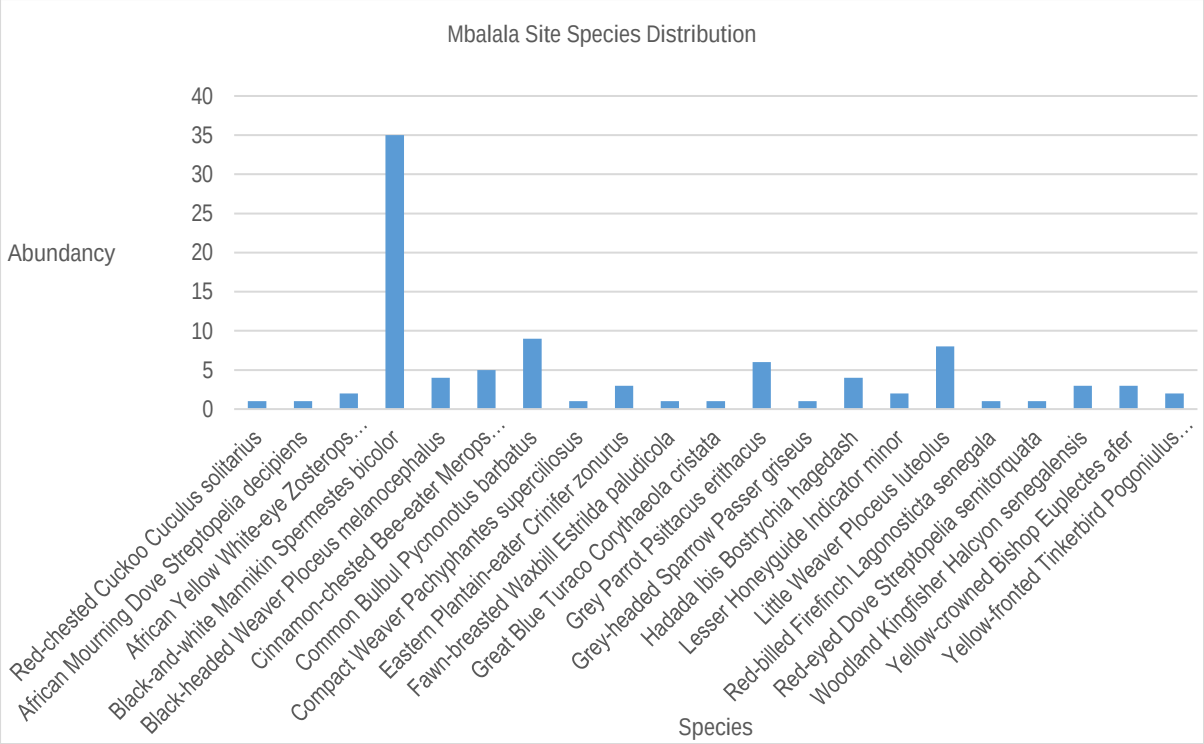


Figure 3.8: Number of species per taxa recorded at Mbalala site

3.1.8 Sezibwa Forest

The most abundant and widely distributed species was the Compact Weaver (*Pachyphantes superciliosus*) which accounted for 29% of the species observed, followed by the Green-throated Sunbird (*Chalcomitra rubescens*) at 6% (Figure 2.9).

Forest visitors recorded included the Speckled Tinkerbird (*Pogoniulus scolopaceus*), Double-toothed Barbet (*Lybius bidentatus*), African Pygmy-Kingfisher (*Ispidina picta*), Crowned Hornbill (*Tockus alboterminatus*), Mariqua Sunbird (*Cinnyris mariquensis*), Fork-tailed Drongo (*Dicrurus adsimilis*), Diderick Cuckoo (*Chrysococcyx caprius*) and the Common Bulbul (*Pycnonotus barbatus*).

Sixteen forest generalists were observed. They included the Buff-throated (*Apalis Apalis)*, Green-throated Sunbird (*Chalcomitra rubescens)*, Ashy Flycatcher (*Muscicapa caerulescens)*, Red-chested Cuckoo (*Cuculus solitaries*), Scaly-breasted Illadopsis *(Illadopsis albipectus*), Abyssinian Ground-Thrush (*Zoothera piaggiae*), Black-and-white Mannikin (*Spermestes bicolor*), Great Blue Turaco (*Corythaeola cristata*), Yellow-whiskered Bulbul (*Andropadus latirostris*), Yellow-rumped Tinkerbird (*Pogoniulus bilineatus*), Red-eyed Dove (*Streptopelia semitorquata*), Black-and-white-casqued Hornbill (*Ceratogymna subcylindricus*), Yellow-throated Tinkerbird (*Pogoniulus subsulphureus*), White-throated Greenbul (*Phyllastrephus albigularis*), Black-headed Paradise-Flycatcher (*Terpsiphone rufiventer*) and Red bellied Paradise flycatcher (*Terpsiphone rufiventer*).

No water Specialists were observed, but seven non-water specialists – the African Pied Wagtail (*Motacilla aguimp*), Compact Weaver (*Pachyphantes superciliosus*), Yellow Wagtail (*Motacilla flava*), African Pygmy-Kingfisher (*Ispidina picta*), Red-chested Sunbird (*Cinnyris erythrocerca*), Malachite Kingfisher (*Alcedo cristata*) and Bocage's Bush- Shrike (*Malaconotus bocagei*) – were observed. Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2).

The Abyssinian Ground-Thrush (*Zoothera piaggiae*) is listed as globally lower-risk / near threatened according to the IUCN Red List of threatened species and regionally endangered according to The Bird Atlas of Uganda (Carswell *et al.* 2007).

Most of the observed species were resident breeders except the African Pygmy-Kingfisher *Ispidina picta,* White-headed Saw-wing *Psalidoprocne albiceps* and the Red-chested Cuckoo *Cuculus solitaries* are resident breeders and an intra-African migrants but nonbreeding, Common Quail *Coturnix coturnix* a winter visitor and an intra-African migrant breeder, Diderick Cuckoo *Chrysococcyx caprius* a resident breeder and an intra-African migrant breeder, the Yellow Wagtail *Motacilla flava* a winter visitor and regular passage migrant and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

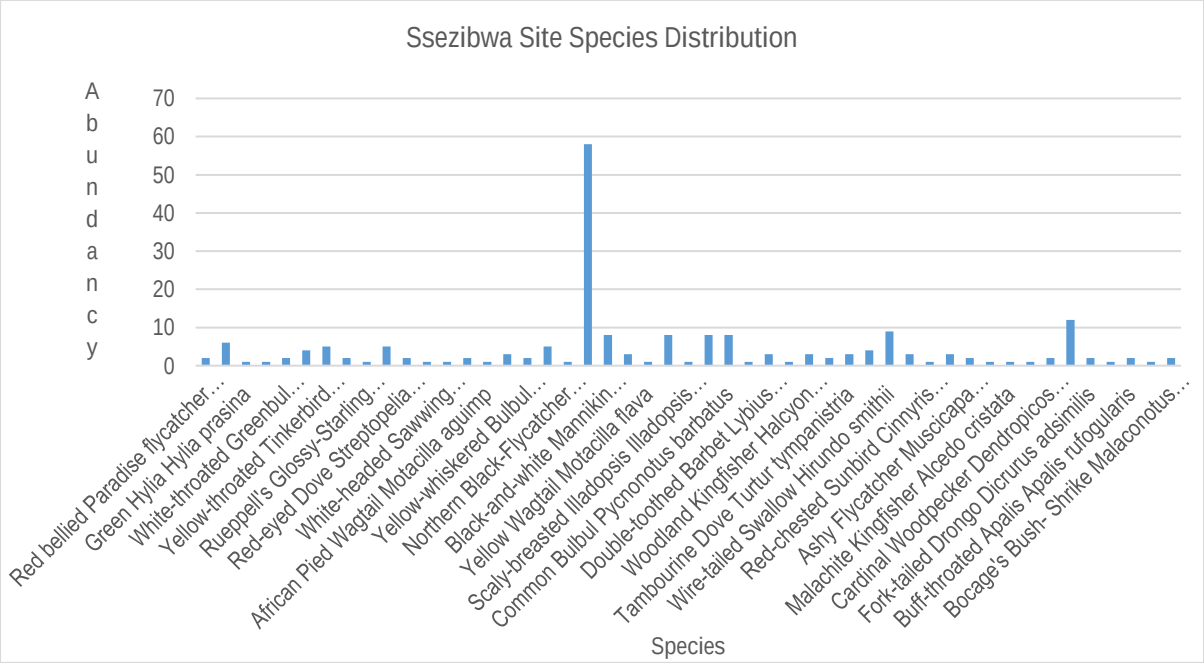


Figure 3.9: Number of species per taxa recorded at Sezibwa site

3.1.9 Cultivations

The most abundant and widely distributed species was the Black-headed Weaver (*Ploceus melanocephalus*), which accounted for 57% of all the species observed followed by the Black-and-white Mannikin (*Spermestes bicolor*) at 11% (Figure 2.10).

Two forest visitors, the Black and White Mannikin (*Spermestes bicolor*) and Common Bulbul (*Pycnonotus barbatus*), as well as six forest generalists – the Ring-necked Dove (*Streptopelia capicola*), Abyssinian Ground-Thrush (*Zoothera piaggiae*), Brown Snake-Eagle (*Circaetus cinereus*), Red-eyed Dove (*Streptopelia semitorquata*), Yellow-rumped Tinkerbird (*Pogoniulus bilineatus*) and Yellow-throated Tinkerbird (*Pogoniulus subsulphureus*) – were recorded.

No water and non-water specialists were observed. Most of the species observed are those referred to as habitat generalists (NF) (Table 1.2 and Appendix 2).

The Brown Snake-Eagle (*Circaetus cinereusas*) and the Abyssinian Ground-Thrush (*Zoothera piaggiae*) are listed as Regionally Near threatened according to The Bird Atlas of Uganda (Carswell et al. 2007).

Most of the observed species were resident breeders except the Black Kite *Milvus migrans* being a resident breeder and regular passage migrant, the Brown Snake-Eagle *Circaetus cinereus* a resident breeder and an intra-African migrant but nonbreeding and the Woodland Kingfisher *Halcyon senegalensis* a regular passage migrant and resident breeder.

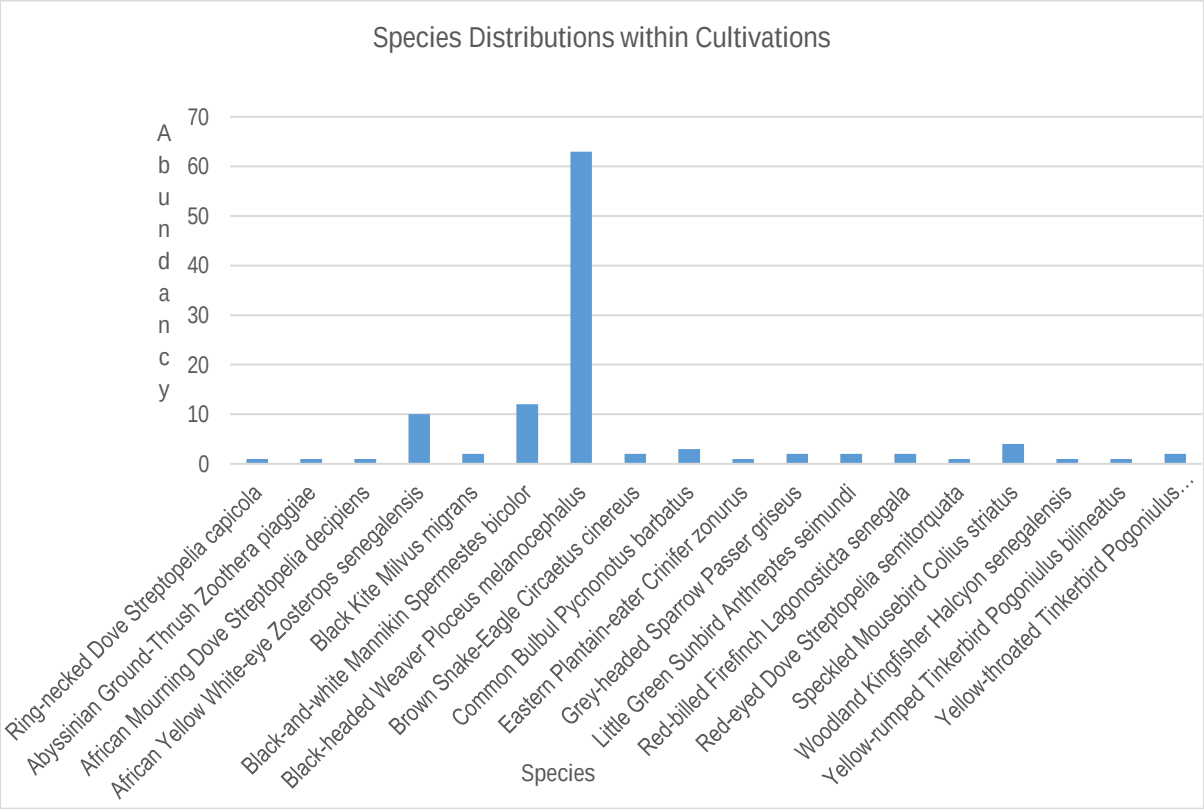


Figure 3.10: Number of species per taxa recorded within Cultivation sites

Table 3.2: Photos of bird species taken during the survey

	
Yellow Wagtail (Sezibwa Forest survey site)	**Great Blue Turaco** (Namanve Wetland, Mbalala and Sezibwa Forest survey sites)

Cattle Egret (Nakivubo Wetland-Bugolobi site)

Black & White Casqued Hornbill (Sezibwa Forest)

Marabou Stork (Kansanga, Nakivubo and Kinawataka wetlands)

Grey Heron (Mayanja and Kansanga Wetland)

Table 3.3: GPS coordinates for nationally and globally rare or threatened species.

Species	Regional and IUCN Status	Sites	Coordinates
AbyssinianGround-Thrush *Zoothera piaggiae*	G-LR/nt, R-EN	Cultivations, Sezibwa	0483118/0039402 0484806/0040010
Brown Snake-Eagle *Circaetus cinereus*	R-NT	Cultivations	0483497/0039464
Cinnamon-chested Bee-eater *Merops oreobates*	R-RR	Mbalala	0480470/0038534 0480371/0038533
Grey Crowned-Crane *Balearica regulorum*	EN, R-NT	Munyonyo, Heritage, Namanve	0457301/0026210 0456438/0027240 0465490/0036805

Species	Regional and IUCN Status	Sites	Coordinates
			0465645/0036554
Grey Heron *Ardea cinerea* (R-NT)	R-NT	Munyonyo, Bukasa	0456547/0025971 0457176/0026367
Grey Parrot *Psittacus erithacus* (G-VU, R-NT)	G-VU, R-NT	Mbalala	0480571/0038561

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5 APPENDICES

Appendix 1: Avifauna survey points for the proposed Kampala Jinja Expressway PPP

Survey area	Coordinate (WGS 84 UTM, 36N)	Habitat
Mayanja Wetland (Munyonyo site)	0456547/0025971	Wetland
	0456642/0026223	
	0457656/0026290	
	0457301/0026210	
	0457220/0026161	
Kansanga and Nakivubo Wetland (Bukasa & Bugolobi)	0458780/0033769	Wetland
	0458798/0033658	
	0458766/0033591	
Kansanga Wetland (Heritage site)	0456911/0030868	Wetland
	0456559/0030754	
Kinawataka Wetland (Kinawataka and Kasokoso)	0459283/0037101	Swamp, Settlement
	0459233/0037124	Agricultural land
	0459177/0037191	
	0461729/003769	
Namanve Wetland	0465488/0036929	Wetland
	0465493/0036869	
	0465522/0036948	
	0465532/0036899	
	0465494/0036838	
	0465490/0036805	
	0465492/0036773	
	0465497/0036738	
	0465500/0036712	
	0465503/0036666	
	0465515/0036591	
	0465571/0036563	
	0465645/0036554	
	0464162/0036322	
	0464363/0036391	
	0466384/0036774	
	0466380/0036707	
	0466413/0036629	
	0466533/0036480	
Kasaala (Mbalala) Wetland	0480631/0038572	Wetland and Riverine forest
	0480571/0038561	
	0480490/0038567	

Survey area	Coordinate (WGS 84 UTM, 36N)	Habitat
	0480454/0038620	
	0480470/0038534	
	0480416/0038543	
	0480371/0038533	
	0480338/0038476	
	0480372/0038478	
	0480469/0038505	
	0480470/0035505	
	0480542/0038517	
	0480566/0038544	
Sezibwa Forest	0483596/0039497	Riverine forest
	0483854/0039587	
	0483950/0039568	
	0484046/0039564	
	0484210/0039548	
	0484390/0039651	
	0484756/0040010	
	0484780/0039933	
	0484806/0040010	
	0484901/0039988	
	0484800/0039417	
	0484351/0039629	
	0484625/0039824	
	0484720/0039763	
	0484779/0039711	
	0484708/0039573	
	0484677/0039428	
	0484683/0039407	
	0484661/0039352	
Sezibwa Forest	0484696/0039355 0484661/0039352	Riverine forest
	0484710/0039363	
	0484741/0039367	
	0484773/0039368	
	0484766/0039312	
	0484792/0039333	
	0484805/0039420	
	0484813/0039437	
Cultivations	0482975/0039481	Agricultural land
	0483027/0039415	

Survey area	Coordinate (WGS 84 UTM, 36N)	Habitat
	0483118/0039402	
	0483231/0039413	
	0483356/0039439	
	0483415/0039457	
	0483497/0039464	
	0484155/0039552	

Appendix 2: List of all Avifauna species observed and recorded in the survey sites

SPECIES	BREEDING & MIGRATORY TREND	HABITAT SPECIALIZATION	IUCN STATUS	ATLAS NUMBER	REGIONAL STATUS
Abyssinian Ground-Thrush *Zoothera piaggiae*	RB	F	G-LR/nt	802/803	R-EN
African Fish Eagle *Haliaeetus vocifer*	RB	w	LC	137	LC
African Harrier-Hawk *Polyboroides typus*	RB	f	LC	96	LC
African Jacana *Actophilornis africanus*	RB	W	LC	225	LC
African Marsh-Harrier *Circus ranivorus*	R(B)	w	LC	95	R-NT
African Mourning Dove *Streptopelia decipiens*	RB	NF	LC	347	LC
African Openbill *Anastomus lamelligerus*	RB,AfM/NB	w	LC	43	LC
African Pied Hornbill *Tockus fasciatus*	RB	NF	LC	519	LC
African Pied Wagtail *Motacilla aguimp*	RB	NF/w	LC	991	LC
African Pygmy-Kingfisher *Ispidina picta*	RB, AfM/NB	f/w	LC	478	LC
African Yellow White-eye *Zosterops senegalensis*	RB	NF	LC	1133	LC
Ashy Flycatcher *Muscicapa caerulescens*	RB	F	LC	938	LC
Beautiful Sunbird *Cinnyris pulchellus*	RB	F	LC	1116	LC
Black Bishop *Euplectes gierowii*	RB	NF	LC	1144	LC
Black Kite Milvus migrans	RB,PM	NF	LC	138	LC
Black-and-white Mannikin *Spermestes bicolor*	RB	f	LC	1265	LC
Black-and-white-casqued Hornbill *Ceratogymna subcylindricus*	RB	F	LC	513	LC
Black-crowned Waxbill *Estrilda nonnula*	RB	NF	LC	1230	LC
Black-headed Heron *Ardea melanocephala*	RB	NF	LC	27	LC
Black-headed Paradise-Flycatcher *Terpsiphone rufiventer*	RB	F	LC	967	LC
Black-headed Weaver *Ploceus melanocephalus*	RB	NF	LC	1165	LC
Blue-headed Coucal *Centropus monachus*	RB	w	LC	404	LC
Blue-spotted wood dove *Turtur afer*	RB	NF	LC	355	LC
Bocage's Bush- Shrike *Malaconotus bocagei*	RB	w	LC	1013	LC
Broad-billed Roller *Eurystomus glaucurus*	RB,AfM/NB	NF/F/f	LC	500	LC
Bronze Mannikin *Spermestes cucullatus*	RB	NF	LC	1266	LC
Brown Snake-Eagle *Circaetus cinereus*	B(B), AfM/NB	F	LC	98	R-NT
Brown-throated Wattle-eye *Platysteira cyanea*	RB	NF	LC	960	LC
Buff-throated Apalis *Apalis rufogularis*	RB	F	LC	826	LC
Cardinal Woodpecker *Dendropicos fuscescens*	RB	NF	LC	585	LC
Cattle Egret *Bubulcus ibis*	RB	NF	LC	32	LC
Cinnamon-chested Bee-eater *Merops oreobates*	RB	F	LC	488	R-RR

SPECIES	BREEDING & MIGRATORY TREND	HABITAT SPECIALIZATION	IUCN STATUS	ATLAS NUMBER	REGIONAL STATUS
Common Bulbul *Pycnonotus barbatus*	RB	f	LC	732	LC
Common Quail *Coturnix coturnix*	WV, AfM/B	NF	LC	165	LC
Common Sandpiper *Actitis hypoleucos*	WV, PM, FB	w	LC	252	LC
Compact Weaver *Pachyphantes superciliosus*	RB	NF/w	LC	1184	LC
Crowned Hornbill *Tockus alboterminatus*	RB	f	LC	515	LC
Diderick Cuckoo *Chrysococcyx caprius*	RB, AfM/(B)	f	LC	388	LC
Double-toothed Barbet *Lybius bidentatus*	RB	f	LC	534	LC
Eastern Olivaceous Warbler *Hippolais pallida*	WV	NF	LC	888	LC
Eastern Plantain-eater *Crinifer zonurus*	RB	NF	LC	376	LC
Fawn-breasted Waxbill *Estrilda paludicola*	RB	NF	LC	1231	LC
Fork-tailed Drongo *Dicrurus adsimilis*	RB	f	LC	644	LC
Grassland Pipit *Anthus cinnamomeus*	RB	NF	LC	981	LC
Great Blue Turaco *Corythaeola cristata*	RB	F	LC	372	LC
Greater Blue-eared Glossy-Starling *Lamprotornis chalybaeus*	R(B)	f	LC	1055	LC
Green Hylia *Hylia prasina*	RB	F	LC	889	LC
Green-backed Camaroptera *Camaroptera brachyura*	RB	f	LC	837	LC
Green-throated Sunbird *Chalcomitra rubescens*	RB	F	LC	1120	LC
Grey Crowned-Crane *Balearica regulorum*	RB, AfM,/NB	NF	EN	194	R-NT
Grey Heron *Ardea cinerea*	RB, FB, OW	NF/w	LC	25	R-NT
Grey Kestrel *Falco ardosiaceus*	RB	NF	LC	147	LC
Grey Parrot *Psittacus erithacus*	RB	F	G-VU	371	R-NT
Grey-backed Fiscal *Lanius excubitoroides*	RB	NF	LC	1032	LC
Grey-headed Sparrow *Passer griseus*	RB	NF	LC	1207	LC
Hadada Ibis *Bostrychia hagedash*	RB	NF	LC	51	LC
Hamerkop *Scopus umbretta*	RB	NF	LC	42	LC
Helmeted Guineafowl *Numida meleagris*	RB	NF	LC	190	LC
Intermediate Egret *Egretta intermedia*	RB	w	LC	38	LC
Isabelline Shrike *Lanius isabellinus*	WV, PM	NF	LC	1034	LC
Laughing Dove *Streptopelia senegalensis*	RB	NF	LC	351	LC
Lesser Honeyguide *Indicator minor*	RB	NF	LC	566	LC
Little Egret *Egretta garzetta*	RB	w	LC	36	LC
Little Green Sunbird *Anthreptes seimundi*	RB	NF	LC	1121	LC
Little Greenbul *Andropadus virens*	RB	NF	LC	705	LC
Little Swift *Apus affinis*	RB	NF	LC	443	LC
Little Weaver *Ploceus luteolus*	RB	NF	LC	1172	LC
Lizard Buzzard *Kaupifalco monogrammicus*	RB	NF	LC	129	LC
Long-tailed Cormorant Phalacrocorax africanus	RB	W	LC	17	LC

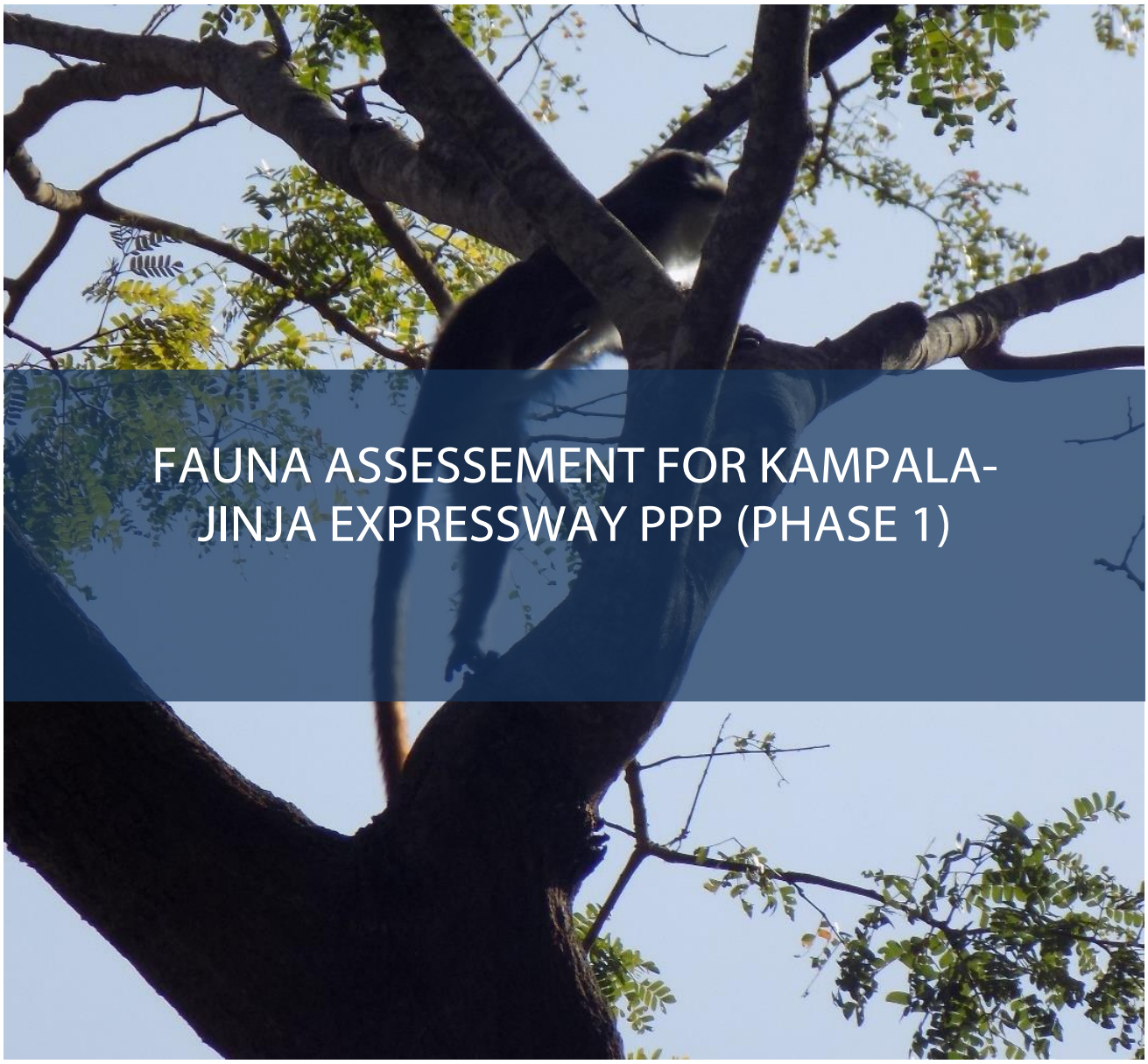
SPECIES	BREEDING & MIGRATORY TREND	HABITAT SPECIALIZATION	IUCN STATUS	ATLAS NUMBER	REGIONAL STATUS
Malachite Kingfisher *Alcedo cristata*	RB	w	LC	466	LC
Marabou Stork *Leptoptilos crumeniferus*	RB, AfM/B	NF	LC	49	LC
Mariqua Sunbird *Cinnyris mariquensis*	RB	f	LC	1107	LC
Northern Black-Flycatcher *Melaenornis edolioides*	RB	NF	LC	934	LC
Pied Crow *Corvus albus*	RB	NF	LC	654	LC
Pied Kingfisher *Ceryle rudis*	RB	W	LC	465	LC
Red bellied Paradise-Flycatcher *Terpsiphone rufiventer*	RB	F	LC	967	LC
Red billed Firefinch *Lagonosticta senegala*	RB	NF	LC	1241	LC
Red-chested Cuckoo *Cuculus solitarius*	RB, AfM/NB	F	LC	399	LC
Red-chested Sunbird *Cinnyris erythrocerca*	RB	NF/w	LC	1098	LC
Red-eyed Dove *Streptopelia semitorquata*	RB	F	LC	350	LC
Ring-necked Dove *Streptopelia capicola*	RB	F	LC	346	LC
Rueppell's Glossy-Starling *Lamprotornis purpuropterus*	RB	NF	LC	1060	LC
Scaly-breasted Illadopsis *Illadopsis albipectus*	RB	F	LC	674	LC
Sooty Chat *Myrmecocichla nigra*	RB	NF	LC	771	LC
Speckled Mousebird *Colius striatus*	RB	NF	LC	459	LC
Speckled Pigeon *Columba guinea*	RB	NF	LC	341	LC
Speckled Tinkerbird *Pogoniulus scolopaceus*	RB	f	LC	553	LC
Spectacled Weaver *Ploceus ocularis*	RB	NF	LC	1177	LC
Stout Cisticola *Cisticola robustus*	RB	NF	LC	869	LC
Tambourine Dove *Turtur tympanistria*	RB	NF	LC	357	LC
Trilling Cisticola *Cisticola woosnami*	RB	NF	LC	873	LC
Variable Sunbird *Cinnyris venustus*	RB	NF	LC	1128	LC
White-browed Coucal *Centropus superciliosus*	RB	NF	LC	406	LC
White-headed Sawwing *Psalidoprocne albiceps*	RB,Af/NB	NF	LC	639	LC
White-rumped Swift *Apus caffer*	RB	NF	LC	447	LC
White-throated Bee-eater *Merops albicollis*	AfM/NB,FB,PM	NF	LC	479	LC
White-throated Greenbul *Phyllastrephus albigularis*	RB	F	LC	718	LC
Willow Warbler *Phylloscopus trochilus*	WV,PM	NF	LC	908	LC
Wire-tailed Swallow *Hirundo smithii*	RB	NF	LC	637	LC
Woodland Kingfisher *Halcyon senegalensis*	PM,RB	NF	LC	475	LC
Yellow Wagtail *Motacilla flava*	WV,PM	NF/w	LC	996	LC
Yellow-crowned Bishop *Euplectes afer*	R(B)	w	LC	1137	LC
Yellow-fronted Tinkerbird *Pogoniulus chrysoconus*	RB	NF	LC	549	LC
Yellow-rumped Tinkerbird *Pogoniulus bilineatus*	RB	F	LC	548	LC

SPECIES	BREEDING & MIGRATORY TREND	HABITAT SPECIALIZATION	IUCN STATUS	ATLAS NUMBER	REGIONAL STATUS
Yellow-throated Tinkerbird *Pogoniulus subsulphureus*	RB	F	LC	555	LC
Yellow-whiskered Greenbul *Andropadus latirostris*	RB	F	LC	701	LC

Appendix 3: List of avifauna species observed by tourists in Ssezibwa forest. (List was provided by a tourist guide at Ssezibwa forest).

SPECIES
African Finfoot *Podica senegalensis*
Village Weaver *Ploceus cucullatus*
Vieillot's Weaver *Ploceus nigerrimus*
Baglafecht Weaver *Ploceus baglafecht*
Red-chested Cuckoo *Cuculus solitarius*
African Emerald Cuckoo *Chrysococcyx cupreus*
Dideric Cuckoo *Chrysococcyx caprius*
Klaas's Cuckoo *Chrysococcyx klaas*
Speckled Mousebird *Colius striatus*
Bocage's Bushshrike *Telophorus bocagei*
Lizard Buzzard *Kaupifalco monogrammicus*
Palm-nut Vulture *Gypohierax angolensis*
African Harrier-Hawk *Polyboroides typus*
Malachite Kingfisher *Alcedo cristata*
Shining-blue Kingfisher *Alcedo quadribrachys*
Snowy-crowned Robin-Chat *Cossypha niveicapilla*
White-browed Robin-Chat *Cossypha heuglini*
Gray-headed Negrofinch *Nigrita canicapilla*
Gray Heron *Ardea cinerea*
Black-headed Heron *Ardea melanocephala*
Hamerkop *Scopus umbretta*
Hadada Ibis *Bostrychia hagedash*
Intermediate Egret *Egretta intermedia*
Cattle Egret *Bubulcus ibis*
Red-shouldered Cuckoo-shrike *Campephaga phoenicea*
Western Nicator *Nicator chloris*
Dusky-blue Flycatcher *Muscicapa comitata*
Blue-spotted Wood Dove *Turtur afer*
Tambourine Dove *Turtur tympanistria*
Bamboo Scrub-Warbler *Bradypterus alfredi*
African Reed-Warbler *Acrocephalus baeticatus*
Fork-tailed Drongo *Dicrurus adsimilis*
Broad-billed Roller *Eurystomus glaucurus*
African Firefinch *Lagonosticta rubricata*
Pin-tailed Whydah *Vidua macroura*

Fan-tailed Widowbird *Euplectes axillaris*
Black Bishop *Euplectes gierowii*
Yellow-fronted Canary *Serinus mozambicus*
Winding Cisticola *Cisticola galactotes*
Tawny-flanked Prinia *Prinia subflava*
Buff-throated Apalis *Apalis rufogularis*
Double-toothed Barbet *Lybius bidentatus*
Hairy-breasted Barbet *Tricholaema hirsuta*
Black Kite *Milvus migrans*
Slender-billed Greenbul *Andropadus gracilirostris*
Lesser Honeyguide *Indicator minor*
White-browed Robin-Chat *Cossypha heuglini*
Red-headed Lovebird *Agapornis pullarius*
Brown-crowned Tchagra *Tchagra australis*
Long-tailed Cormorant *Phalacrocorax africanus*
Common Sandpiper *Actitis hypoleucos*
Crowned Hornbill *Tockus alboterminatus*



FAUNA ASSESSEMENT FOR KAMPALA-JINJA EXPRESSWAY PPP (PHASE 1)

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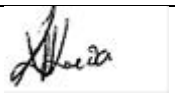
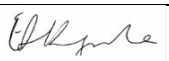
Author	Denis Kyongera	Fauna Specialist		29/03/2018	1
Reviewer (s)	Lorna Ngabirano	Project Manager		4/04/2018	2
Approver	Edgar Mugisha	ESIA Team Leader		24/04/2018	3

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

WET SEASON FAUNA ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

1 INTRODUCTION

Phase I of the Kampala-Jinja Expressway (KJE) Project is comprised of the Kampala Southern Bypass (KSB) and the KJE mainline as far as Namagunga in Buikwe District.

The KSB is a proposed four-lane, dual carriage highway connecting Bweyogerere to Munyonyo. The road will start at Bweyogerere on the KJE mainline, near Mandela National Stadium at Namboole. It will pass through Butabika, Luzira, Kyeyitabya and Heritage village and end at Munyonyo, where it will join the southern spur of the Kampala-Entebbe Expressway.

The KJE mainline (Phase 1) will start at the Lugogo Bypass-Jinja Road junction near Shoprite, continue along the existing Jinja Road through Nakawa, and turn at Spear Motors Ltd to pass through Kinawataka, Bweyogerere, Namanve, Namilyango, Mukono, Mbalala and Namataba, ending at Namagunga..

The proposed road will traverse and impact natural resources such as forests, rivers and wetlands. It is a requirement that IFC funded projects comply with the IFC Performance Standard 6 on biodiversity conservation and sustainable management of living natural resources.

The purpose of this study is to provide wet season fauna baseline information along the Phase 1 alignment as part of the ESIA for the Kampala – Jinja Expressway PPP Project (Phase 1). It also discusses observed threats to the habitats along the proposed KJE alignment. The fauna survey was conducted between 19th and 23rd December 2017, which was a wet season in Central Uganda.

1.1 Scope and Extent of the Assessment

The tasks undertaken for this terrestrial fauna baseline specialist study were:

- Review of the Ugandan environmental regulations and international standards and guidelines regarding ecology (fauna);
- Collection and review of third-party baseline data; and
- Collection of site-specific primary data through a baseline field survey in December 2017.

The mammal baseline survey was limited to medium and large mammals within the existing natural habitats within the project area of influence. It is important to note that most of the existing habitats along the proposed alignment have already been heavily modified by human activities

1.2 Overview of Specific Legislation and Guidelines/Standards

This section summarizes the specific Ugandan legislation and IFC requirements addressing ecology. It complements Chapter 2 of the ESIA.

1.2.1 Key Ugandan Policies

The key Ugandan policies with respect to ecology are:

I. The National Environment Management Policy (1995). The overall goal of the policy is the promotion of sustainable economic and social development, mindful of the needs of future generations. The policy calls for the integration of environmental concerns into development policies, plans and projects at national, district and local levels. Hence, the policy requires that projects likely to have significant adverse ecological or social impacts undertake an ESIA before their implementation.

II. Wildlife Policy (2014): The overall goal of the policy is the conservation of the wildlife resources of Uganda in a manner that contributes to the sustainable development of the nation and well-being of its people. The policy seeks to establish standards, guidelines and mitigation measures to be followed for any development activities that may have significant impacts on wildlife, and hence provides a basis for undertaking an ESIA.

1.2.2 Key Ugandan Regulatory Texts

1.2.2.1 National Environment Act (1995)

The main law relating to the protection of the environment in Uganda is the National Environment Act (NEA), Cap 153 of 1995. It concerns protection and preservation of the environment and establishes measures to manage the environment for sustainable development and promotion of environmental awareness. The National Environment Management Authority (NEMA) was created under the NEA and is mandated with the responsibility to oversee, coordinate and supervise environmental management in Uganda, including the review of environmental impact assessments carried out for various projects. The Act provides for various strategies and tools for environmental management, which also include EIA (Section 19) for projects likely to have significant impacts on the environment. A person who owns or occupies land shall manage and utilise the land in accordance with the National Environment Act 1995 and any other laws binding.

1.2.2.2 The Land Act (1998)

The Land Act provides that the national government shall hold land in trust for the people and protect natural lakes, ground water, natural streams, wetlands and any other land reserved for ecological purposes for the common good of the citizens of Uganda. A local government may, upon request to the government, be allowed to hold land in trust for the people and the common good of the citizens of Uganda. Sections 43, 44 and 45(1) and (2) of the Land Act (1998), provides that national or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda.

1.2.2.3 Wildlife Act (2000)

The Wildlife Act, Cap 200 of 2000 is the principle law for the protection, conservation and management of wildlife in Uganda. The law established the Uganda Wildlife Authority (Section 4), a body mandated to ensure sustainable management of wildlife resources and supervise wildlife activities both within and outside protected areas in Uganda. Section 15(1) of the Act requires any developer desiring to undertake any project which a significant effect on any wildlife species or community may have to undertake an environmental

impact assessment in accordance with the National Environment Act. Section 27 sets procedures for declaration of a species a protected species. Section 29 of the Wildlife Act establishes the wildlife use rights through which the local communities may sustainably utilize wildlife.

1.2.3 International Conventions

1.2.3.1 The Convention on Biological Diversity, 1992

The convention's objectives are to conserve biological diversity and promote the sustainable use of its components. It also promotes fair and equitable sharing of the benefits of the utilisation of genetic resources, including by appropriate access to genetic resources, appropriate transfer of relevant technologies, and appropriate funding (Article 1). Uganda signed the convention on 8/9/1993.

1.2.3.2 CITES

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction of species covered by CITES must be authorized through a licensing system. Uganda signed the convention on 18/07/1991.

1.2.3.3 The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), 1979.

The Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. This convention was ratified/signed in August 2000.

1.2.3.4 The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA), 1995

The Agreement provides for co-ordinated and concerted actions to be taken by the Range states throughout the migration systems of the water birds to which it applies. It also requires them to investigate problems that are posed or are likely to be posed by human activities and endeavour to implement remedial measures, including habitat rehabilitation and restoration, and compensatory measures for loss of habitat. This convention was ratified/signed in December 2000.

2 FAUNA ASSESSMENT METHODS

The mammal baseline survey within the Project Area of Influence was undertaken from 19th to 23rd December 2017, which is a wet season in Central Uganda. Direct and indirect methods were used to survey mammals. The methods used are as follows.

2.1 Literature Review

A desktop review of available literature about the fauna and habitats in the project area of Influence was undertaken. The literature included the Kampala Southern Bypass ESIA (ICS, 2015), the Kampala–Jinja Road Capacity Improvement ESIA (URS, 2015), the Environment and Social Management Framework for Kampala Industrial Business Park (Namanve) (2014), the Uganda Wetland Atlas (GOU 2016), and the Kingdon Field Guide to African Mammals (Second edition, 2015).

2.2 Reconnaissance Visit

A reconnaissance visit along the proposed KJE Phase one alignment was undertaken on 17th December 2017, to identify the type of habitats within the project area of influence. The visit guided the selection of sampling sites for the fauna study.

2.3 Transect Walks

The presence and numbers of mammals were surveyed along line transects using the following methods:

- Direct enumeration - all mammals that were observed were identified to species level and the numbers of each species counted; and
- Identification of footprints, dung and/or calls – footprints and dung of large and medium-sized herbivores and carnivores were identified to species level, and footprints provide a relative index of the number of animals that use the site.

2.4 Interviews with Local Community and User Groups

Interviews were held with local communities, user groups (hunters) and reserve area managers to inform the identification of mammals and threats to the habitats within the project area of influence. Animals reported by the local community were checked in the Kingdon Field Guide to African Mammals (second edition, 2015) and pictures shown to the local people to confirm the description/identification of the mammals reported to be observed within the habitats.

2.5 Assessment of Conservation Status

All the mammal species identified were assessed against the IUCN Red List (IUCN, 2017) and the National Red List for Uganda (WCS, 2016). The national status (National Red List for Uganda) is applied in accordance with the IUCN guidelines. There are two additional acronyms not present in the global categories:

- NA – not applicable, i.e. the species is not relevant to Uganda and cannot be nationally assessed (usually because the species is thought to be a vagrant or not present); and
- RE – the species is regionally extinct in the wild.

The conservation status categories are followed by other criteria used in the assessment. A summary of the criteria is provided here, and for full details refer to the Guidelines for Application of IUCN Red List Criteria (IUCN 2012b).

- Criteria A: Population size reduction (the rate of decline of the species can be estimated over time and may be used in cases where the population size is not known).
- Criteria B: The geographic range of the species is limited, and the species is known to be declining.
- Criteria C: Small population size (evidence of decline can be used where an estimate of population size cannot be made).
- Criteria D: Very small or restricted populations.
- Criteria E: Can only be used where a quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations has been made. No quantitative analysis has been available for Uganda and Criteria E: has not been used in this assessment.

2.6 Surveyed Habitat/Sites

The proposed KJE Alignment runs through mainly agricultural land and settlements, but also crosses both natural and modified habitats in Mayanja Wetland (Munyoyo), Kansanga Wetland, Nakivubo (Bugolobi) Wetland, Kinawataka Wetland, Namanve Wetland, Kasaala (Mbalala) Wetland and Sezibwa Forest. The habitats selected for fauna surveys (Tabele 2.1 and Figure 2.1) are as follows.

Table 2.1 Coordinates of Survey Locations

Point ID	Northing	Easting	Habitat
1	484376	39628	Sezibwa Forest
2	484359	39616	Sezibwa Forest
3	484311	39574	Sezibwa Forest
4	484285	39551	Sezibwa Forest
5	484252	39539	Sezibwa Forest
6	483647	39531	Sezibwa Forest
7	483599	39494	Sezibwa Forest
8	483624	39514	Sezibwa Forest
9	483464	39459	Sezibwa Forest
10	483417	39452	Sezibwa Forest
11	483372	39441	Sezibwa Forest
12	480479	38454	Mbalala(Kasaala) Wetland

Point ID	Northing	Easting	Habitat
13	480461	38466	Mbalala(Kasaala) Wetland
14	480437	38464	Mbalala(Kasaala) Wetland
15	480421	38458	Mbalala(Kasaala) Wetland
16	480406	38453	Mbalala(Kasaala) Wetland
17	480394	38448	Mbalala(Kasaala) Wetland
18	480382	38446	Mbalala(Kasaala) Wetland
19	480377	38448	Mbalala(Kasaala) Wetland
20	480450	38433	Mbalala(Kasaala) Wetland
21	480436	38422	Mbalala(Kasaala) Wetland
22	480414	38396	Mbalala(Kasaala) Wetland
23	465501	36682	Namanve Wetland
24	465501	36668	Namanve Wetland
25	464443	36446	Namanve Wetland
26	464442	36457	Namanve Wetland
27	464454	36462	Namanve Wetland
28	466383	36702	Namanve Wetland
29	466405	36658	Namanve Wetland
30	466419	36607	Namanve Wetland
31	466436	36555	Namanve Wetland
32	466469	36505	Namanve Wetland
33	466514	36479	Namanve Wetland
34	458744	33536	Kasanga Wetland
35	458742	33484	Kasanga Wetland
36	457059	26177	Mayanja Wetland
37	457054	26141	Mayanja Wetland
38	457052	26080	Mayanja Wetland
39	457054	26057	Mayanja Wetland
40	456272	27266	Mayanja Wetland
41	456322	27243	Mayanja Wetland
42	456352	27206	Mayanja Wetland
43	456389	27153	Mayanja Wetland
44	456424	27122	Mayanja Wetland

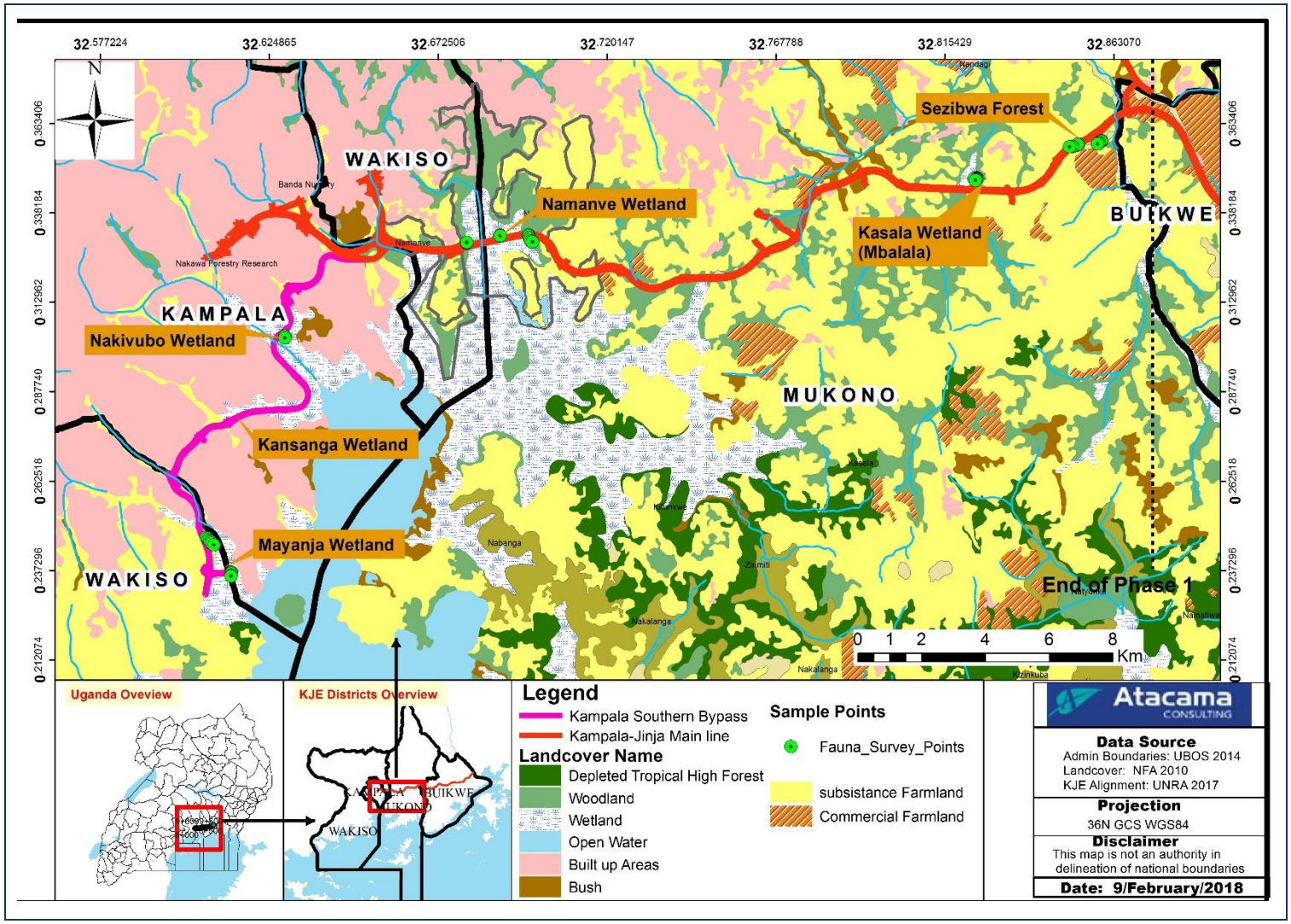


Figure 2.1 Fauna Survey Points

2.6.1.1 Mayanja Wetland (Munyonyo Site)

Mayanja wetland has two distinctly different habitat types that are separated by the new Kampala–Entebbe Expressway. The natural (papyrus) habitat (Plate 2.1) on the lower side, and highly modified habitat (Plate 2.2) on the upper side.

The natural habitat is mainly dominated by Papyrus (Plate 2.1a) with habitat disturbance along the edges including brick-making (Plate 2.1b), fish ponds (Plate 2.1c) and papyrus harvesting by the local community (Plate2.1b).

The modified habitat is highly degraded by human activities such as brick-making (Plate 2.2a), waste pits (Plate 2.2b), agricultural firms (Plate 2.2c), access roads (Plate 2.2d), housing encroachment (Plate 2.2e), and invasion by water hyacinth (Plate2.2f). The proposed KJE alignment will cross this section of degraded Mayanja wetland.

a) Natural Section of Mayanja Wetland (Papyrus)

b) Woman carrying harvested Papyrus canes, eucalyptus plantation and bricking making in the photo background

c) Fish ponds at the edges of Mayanja Wetland

Plate 2.1 Lower section (natural habitat) of Mayanja Wetland.

	
a) Brick making and banana plantation in the degraded habitat	b) Waste dumping in the degraded habitat
	
c) Clearing land for agricultural expansion in the degraded section of Mayanja wetland	d) Access road established by the local community through the degraded Mayanja Wetland section
	
e) Housing encroachment on the degraded section of Mayanja Wetland	f) Water Hyacinth in the degraded section of Mayanja Wetland

Plate 2.2 Upper section degradation habitat of Mayanja Wetland

2.6.1.2 Kansanga Wetland

Kansanga wetland covered 4.54 km^2 until 2008, when people started filling it with murram for either settlement or agriculture (Uganda Wetland Atlas, 2016). The Uganda Wetland Atlas indicates that the

current wetland has been "constricted to a narrow channel in the upstream area" as more settlers extend to the Ggaba road which is in the vicinity of Lake Victoria. At the time of the survey, housing encroachment (Plate 2.3a), waste dumping (Plate 2.3b), agricultural expansion into wetland (Plate 2.3c), and the invasive species *Lantana camara* (plate 2.3d) were all observed in the heritage village of the Kansanga Wetland.

a) Housing encroachment and yam plantation

b) Waste dumping in Kansanga Wetland

c) Rice pads in Kansanga Wetland at the Heritage site

d) Lantana Camara in Kansanga Wetland

Plate 2.3 Habitat quality of Kansanga Wetland at the Heritage site.

2.6.1.3 Nakivubo Wetland

Nakivubo wetland is the biggest wetland in Kampala, covering 5.29 km^2. It is permanent wetland (permanently water logged) and covers most parts of Nakawa, Bugolobi, Mpanga and Muyenga hills, carrying and filtering all water from the hinterland into Lake Victoria (Uganda wetland Atlas 2016). Nakivubo wetland hosts Bugolobi Sewerage Treatment Plant, managed by the National Water and Sewerage Corporation. Degradation of Nakivubo wetland started as small land encroachment on the wetland mainly for rudimental agriculture in 2000 but, 10 years later, settlements and industries have been built in Wakaliga valley, Namuwongo, Kitintale, Mpanga valley, Bugolobi and Kitintale, decimating the wetland's ability to filter water (Uganda Wetland Atlas, 2016). At the investigated section (Bugolobi site), yam growing (Plate 2.4a), housing encroachment (Plate 2.4b) and industry development (Plate 2.4b) were observed as the major drivers of habitat degradation.

	
a) Yams growing in Nakivubo at Bugolobi site	**b) Housing and industry development in the background along Nakivubo wetland**

Plate 2.4 Habitat quality of Nakivubo Wetland at Bugolobi site

2.6.1.4 Namanve Wetland

Namanve Forest Reserve used to cover an area of about 2,018 ha and a third of this formed the Namanve Wetland, stretching all the way from Lake Victoria. In 1928, the government established a eucalyptus plantation with drainage channels and later in 1997 part of the forest reserve was degazetted to provide land for an Industrial Park by the Uganda Investment Authority. The proposed road alignment will cross over natural wetland in Namanve dominated by papyrus vegetation (Plate 2.5a). In addition to industrial development in Namanve, human activities such as clay mines, agriculture and brick-making (Plate 2.5b) were observed at the edges of the wetland.

	
a) Namanve Wetland	b) Brick-making using clay mined from edges of Namanve wetland

Plate 2.5 Habitat quality at Namanve wetland

2.6.1.5 Kasaala (Mbalala) Wetland

This is a permanent wetland dominated by papyrus vegetation. The wetland is heavily encroached on from the south side where it has been cleared for agriculture. At the time of the survey some parts of the wetland had been burnt (Plate 2.6a) to pave way for agricultural expansion. Other activities in the wetland included sand mining (Plate 2.6b) and fish ponds.

a) Burning in Kasala (Mbalala) Wetland

b) Sand mining in Kasaala (Mbalala) Wetland

Plate 2.6 Habitat quality at Kasaala (Mbalala) Wetland

2.6.1.6 Sezibwa Forest

Sezibwa forest is riverine forest along River Sezibwa. It is mostly secondary forest dominated by trees averaging 15m height (Plate 2.7a). Habitat threats to Sezibwa forest include agricultural encroachment (Plate 2.7b) and firewood collection by the local community (Plate 2.7c). There are also existing access roads (Plate 2.7d) through the forest.

a) Sezibwa Riverine Forest

b) Maize garden at the edges of Sezibwa forest

	
c) Firewood collection in Sezibwa forest	d) Access road through Sezibwa forest along which the proposed alignment will pass

Plate 2.7 Habitat quality at Sezibwa Forest.

3 RESULTS

3.1 Mayanja Wetland (Munyonyo site)

Transect walks guided by one of the local hunters identified signs (resting ground, tracks) of sitatunga (*Tragelaphus spekii Speke,* 1863) in the natural (papyrus) habitat section of Mayanja wetland (Plate 3.1), however the survey was limited by the volume of water in the wetland (above the knee) at the time. No evidence of medium to large-sized mammals or other large animals were observed in the degraded section of Mayanja wetland.

a) Resting ground of the sitatunga where it was previous sighted by the local hunters (0457013E, 0026116N)

b) Papyrus recently brought down by the horn of the stitatuga (0457043E, 0026130N)

c) Local hunter point at the track of the sitatunga

d) Sitatunga track within the wetland (0457013E 0026123N)

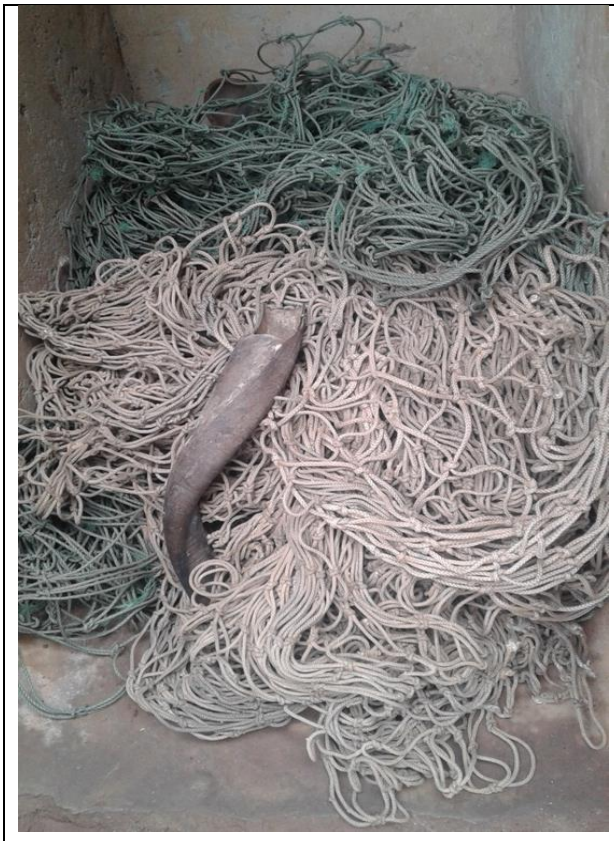
Plate 3.1 Animal evidence within Mayanja Wetland (Natural Papyrus Section).

Interviews held with hunters from the local community on 17th and 19th December 2017 revealed the following about hunting in Mayanja Wetland:

- There are three groups of hunters that practise hunting in the Mayanja wetland,
- Each group consists of 6 to 8 members;
- Hunting is done as part of their cultural custom (Buganda culture) during their leisure time, or opportunistically if an animal is spotted;
- The sitatunga (Enjobe, (*Tragelaphus spekii Speke,* 1863)) is the main animal of interest for hunting;
- serval cats (*Leptailurus serval*)and edible rats (*Thryonomys swinderianus*) were reported to be present in the wetland;
- One hippotamus (*Hippopotamus amphibious*) was also reported to have been killed close to lake victoria five years back, however no other hippo had been sighted since then;
- Usually the person who first observes the animal takes a bigger share and the skin hide (Plate 3.2a);
- The hunters only hunt mature animals and avoid the young ones;
- Hunting is done using hunting nets (Plate 3.2b and 3.2d), sounding horns (Plate 3.2c), spears (Plate 3.2d) and dogs;
- The hunting nets are hand made by the hunters using nylon gauze;
- When an animal is caught a horn is blown to alert other members of the community who may be interested in buying a share of the bush meat;
- Bush meat is prefered to beef because of it's taste;
- Hunting is usually undertaken at least four times a year; and
- A decade ago the hunters used to catch 8 to 10 animals per year, but now catch only 3 to 4 animals per year due to increased population pressure and habitat degration.

At the time of the survey, the hunters had organised to hunt in the wetland. However, when we requested to take their photos, they turned down our request in fear that we could have been law enforcement officers.

a) Sitatunga skin hide owned by one of the hunters (this sitatunga was previously caught in Mayanya wetland)



b) Nets used for hunting

c) Horn of the stitatuga used in hunting

d) Hunting net spread out

e) Huntng spear

Plate 3.2: Tools used by the hunter to hunt in Mayanja Wetland

3.2 Kansanga and Nakivubo wetland

Other than domestic animals (goats), no medium to large mammals were observed in Kansanga and Nakivibo. An interview with the local community also revealed there are no known medium to large mammals within the surveyed habitats.

3.3 Namanve wetland

Other than domestic animals (cows), no medium to large scale mammals were observed in Namanve Wetland. An interview with local community members and a Namanve UPDF Officer in charge of security in Namanve wetland revealed that there were no hunting activities taking place close to the proposed road alignment however hunting is being undertaken downstream the wetland. An interview with local hunters as part of the local knowledge survey downstream of the wetland (Bukasa, 463004E, 0033959N)) revealed presence of medium and large mammals within the wetland. The mammals reported include, Sitatunga, Vervet monkey, Red-tailed monkey, Greater cane rat, Crested porcupine, Black-backed jackal, African civet, and Banded mongoose. Animals like bush buck, Bush pig and Bush duiker were reported to have been hunted to local extinction.

Hunting within the Namanve wetland is undertaken usually twice a week (Sunday and Thursday**)** by a group of hunters consisting of four to twenty members. The local hunter usually target the Sitatunga (Plate 3.3a). Hunting is undertaken using dogs, spears (Plate 3.3b), hunting nets and same times with the help of the boat if the animal runs close to the lake.

	
a) Sitatunga skin hide owned by one of the hunters (this sitatunga was previously caught in Namanve wetland)	b) Spear used in hunting

Plate 3.3: Evidence of hunting in Namanve wetland.

3.4 Kasaala (Mbalala) Wetland

Transect walks in Kasaala (Mbalala) wetland revealed the presence of bush duiker (*Sylvicapra grimmia*), sitatunga (*Tragelaphus spekii Speke,* 1863) and vervet monkey (*Chlorocebus pygerythrus*), based on footprints (Plate 3.4) within the wetland.

a) Bush Duiker footprint (0480469, 0038505)

b) Sitatunga foot print (480416E, 38543N)

c) Vervet Monkey foot print (480371E, 38477`N)

Plate 3.4: Animal evidence observed in Kasaala (Mbalala) Wetland.

An interview with a local hunter on 22nd December 2017 revealed the presence of medium to large mammals (Table 3.1) in Kasaala (Mbalala) wetland. Hunting is part of local recreation activities and is undertaken three to four times a year. There are two known groups of hunters, each consisting of three to four members. Hunting is undertaken using animal traps (Plate 3.4a), spears (Plate 3.4b) and hunting dogs.

Table 3.1 Mammals reported to inhabit Kasaala wetland by the local hunters

Animal Name	Local Name	Scientific names	National Conservation Status	IUCN Conservation Status
Civet cat	Ffumbe	*Civettictis civetta*	Not assessed	Least Concern
Genet	Kasimba	*Genetta genetta*	Not assessed	Least Concern
Edible rat	Omusu	*Thryonomys swinderianus*	Not assessed	Least Concern
Bush Duiker	Empeewo	*Sylvicapra grimmia*	Not assessed	Least Concern
Giant Pangolin	Lugave	*Smutsia gigantea*	Vulnerable (VU A2d)	Vulnerable

Bush buck	Engabi	*Tragelaphus scriptus*	Not assessed	Least Concern
Serval cat	Emmondo	*Leptailurus serval*	Not assessed	Least Concern

a) Animal trap

b) Spear used In hunting

Plate 3.5: Hunting equipment used in Kasaala (Mbalala) Wetland.

3.5 Sezibwa Forest

Transect walks in Sezibwa forest identified five Vervet monkeys *Chlorocebus pygerythrus*, (484805E, 40010N) and eight Red Tailed Monkeys *Cercopithecus ascanius* (484800E, 39417N) (Plate 3.5) in Sezibwa Forest. An interview was held with the senior tourist guide (Mr. Christopher, who also manages biodiversity conservation in Sezibwa forest) to identify some of the animals found in Sezibwa riverine forest and wetland. Some of the animals reported by the guide to inhabit Sezibwa forest include: vervet monkeys, red tailed monkeys, grey cheeked mangabey, giant rat, banded mongoose, squirrels, serval cat, leopard tortoise, bushbuck, palm civet, fruit bats and sitatunga. However, he reported that unlike other animals the sitatungas are very rarely seen.

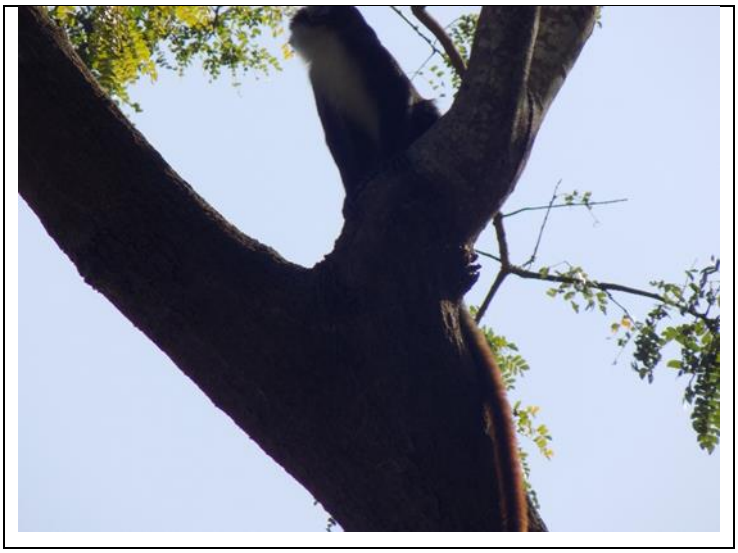


Plate 3.6 Red Tailed Monkey (484800E, 39417N) in a tree in Sezibwa Forest

3.5.1 Species of Conservation Importance

Provided in Table3.2 is the conservation status of the recorded species within the habitats along the KJE alignment

Sitatungas (*Tragelaphus spekii* Speke, 1863), whose signs (resting ground, foot print, track) were observed in Mayanja wetland and Kassala (Mbalala) wetland, are classified as being of Least Concern according to the IUCN Red list (IUCN, 2017). In the National Red List for Uganda (WCS, 2016), they are listed as Vulnerable (VU B1b(i)c (i), wide spread, i.e. vulnerable to extinction). Sitatunga occur in tall and dense vegetation of perennial and seasonal swamps, marshy clearings within forests, riverine thickets, and mangrove swamps. In savanna environments, they are typically found in extensive monospecific stands of papyrus *Cyperus papyrus* and the reeds *Phragmites* spp. and *Echinochloa pyramidalis* (IUCN, 2017). Sitatunga usually avoid open water devoid of vegetation (IUCN 2017). They are selective mixed feeders taking a range of grasses, sedges and browse (IUCN, 2017).

Although the survey team did not directly observe any Pangolins during the survey, a local hunter reported the presence of Giant Pangolins in Kasaala (Mbalala) wetland. The Giant Ground Pangolin is listed as Vulnerable in the IUCN Red List (IUCN, 2017) and nationally listed as Vulnerable (VU A2d) in the National Red List for Uganda (WCS, 2016). The Giant Pangolin is listed in Appendix 1 of CITES (CITES 2017). Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

The hippopotamus *Hippopotamus amphibious* reported by hunters at Mayanja wetland is lists as Vulnerable in the IUCN Red List (IUCN, 2017) and nationally listed as Vulnerable (Vulnerable B2b(iii)c(iv) in the National Red List for Uganda (WCS, 2016).

The Leopard Tortoise (*Stigmochelys pardalis*, Bell 1828), also reported in Sezibwa forest by the sezibwa tour guide, is listed under Appendix II of CITES as a species that is not necessarily threatened with extinction but that may become threatened unless trade in them is controlled. International trade in species listed in Appendix II may be authorised by the granting of an export permit or re-export certificate.

Table 3.2: Conservation status of recorded or reported mammal species

Common Name	Scientific names	National Conservation Status	IUCN Conservation Status
Sitatunga	*Tragelaphus spekii*	Vulnerable B1b(i)c(i)	Least Concern
Hippopotamus	*Hippopotamus amphibius*	Vulnerable B2b(iii)c(iv)	Vulnerable
Civet cat	*Civettictis civetta*	Least Concern	Least Concern
Genet	*Genetta genetta*	Least Concern	Least Concern
Edible rat	*Thryonomys swinderianus*	Least Concern	Least Concern
Bush Duiker	*Sylvicapra grimmia*	Least Concern	Least Concern
Giant Pangolin	*Smutsia gigantea*	Vulnerable (VU A2d)	Vulnerable
Bush buck	*Tragelaphus scriptus*	Least Concern	Least Concern
Serval cat	*Leptailurus serval*	Least Concern	Least Concern
Vervet monkey	*Chlorocebus pygerythrus,*	Least Concern	Least Concern

Common Name	Scientific names	National Conservation Status	IUCN Conservation Status
Red Tailed Monkey	*Cercopithecus ascanius*	Least Concern	Least Concern
Crested porcupine	*Hystrix indica*	Least Concern	Least Concern
Banded mongoose	*Mungos mungo*	Least Concern	Least Concern
Greater cane rat	*Thryonomys swinderianus*	Least Concern	Least Concern
Black backed jackal	*Canis mesomelas*	Least Concern	Least Concern
Grey-cheeked Mangabey	*Lophocebus albigena*	Least Concern	Least Concern
African palm civet	*Nandinia binotata*	Least Concern	Least Concern

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WET SEASON HERPETO-FAUNA ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

By

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

WET SEASON HERPETOFAUNA ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

1 INTRODUCTION

Phase I of the Kampala-Jinja Expressway PPP (KJE) comprises the Kampala Southern Bypass (KSB) and the Kampala-Jinja Expressway mainline as far as Namagunga, Buikwe District. The Kampala Southern Bypass is a proposed four-lane, dual carriage highway connecting Bweyogerere to Munyonyo. The road will start at Bweyogerere on the Kampala–Jinja Expressway (KJE), near Mandela National Stadium at Namboole. It will pass through Butabika, Luzira, Kyeyitabya and Heritage village to end at Munyonyo, where it will join the southern spur of the Entebbe–Kampala Expressway.

The KJE mainline (Phase 1) will start at the Lugogo Bypass-Jinja Road junction near Shoprite, continue along the existing Jinja Road through Nakawa, and turn at Spear Motors Ltd to go through Kinawataka, Bweyogerere, Namanve, Namilyango, Mukono, Mbalala and Namataba, ending at Namagunga.

The proposed road will traverse and impact on natural resources such as forests, rivers and wetlands. It is a requirement that IFC funded projects should comply with the IFC Performance Standard 6 on biodiversity conservation and sustainable management of living natural resources.

This study provides wet season herpeto-fauna baseline information and a discussion of observed habitat threats. The herpeto-fauna survey was conducted between 20th and 23rd December 2017, which was the end of a wet season in Central Uganda.

1.1 Objectives of the Study

The objectives of the study are:

- Assess the distribution and abundance of herpetofauna in the project area;
- Describe critical herpetofauna habitat types and distribution in the project area; and
- Document the conservation status of herpetofauna in the project area.

2 METHODS

2.1 Study Area

Five sites (Table 2.1) were surveyed for herpeto-fauna between 21st and 23rd of December 2017, which was a wet season. The selected sites represent some of the remaining extensive wetland along the Kampala-Jinja Expressway. The surveyed sites (Figure 2.1) include Namanve Wetland, Kasaala Wetland (Mbalala/wankoba), Sezibwa Forest (Lukonge), Mayanja Wetland (Munyonyo) and Kasanga Wetland (Bukasa-Muyenga). Appendix I presents the Habitat Quality Assessment data and Appendix II presents habitat quality photos of surveyed habitats.

Table 2.1 Sites Surveyed for Herpeto-fauna and Habitat Quality Assessment.

Date	Way Points	Site	Easting	Northing	Altitude (masl)	Habitat description
21-Dec-17	416-419	Namanve Wetland	465717	36836	1140-1141	Extensive wetlands, dominated by Papyrus, with heavy urban disturbance
22-Dec-17	424-430	Kasaala (Mbalala/Wankobya) Wetland	480499	38635	1112-1115	Permanent Wetland
22-Dec-17	436-440	Sezibwa Forest (Lukonge)	480499	38635	1154-1170	Fragmented forest surrounded by agricultural landscape, with river in valley
23-Dec-17	449-473	Mayanja (Kabili-Kabwuma-Munyonyo) Wetland	456552	26034	1132-1142	Highly degraded wetland, dominated by Papyrus, with brick making and rice growing activities in some places
23-Dec-17	474-480	Kansanga (Bukasa-Muyenga) wetland	457866	31200	1137-1142	Degraded permanent wetland with rice growing in some place

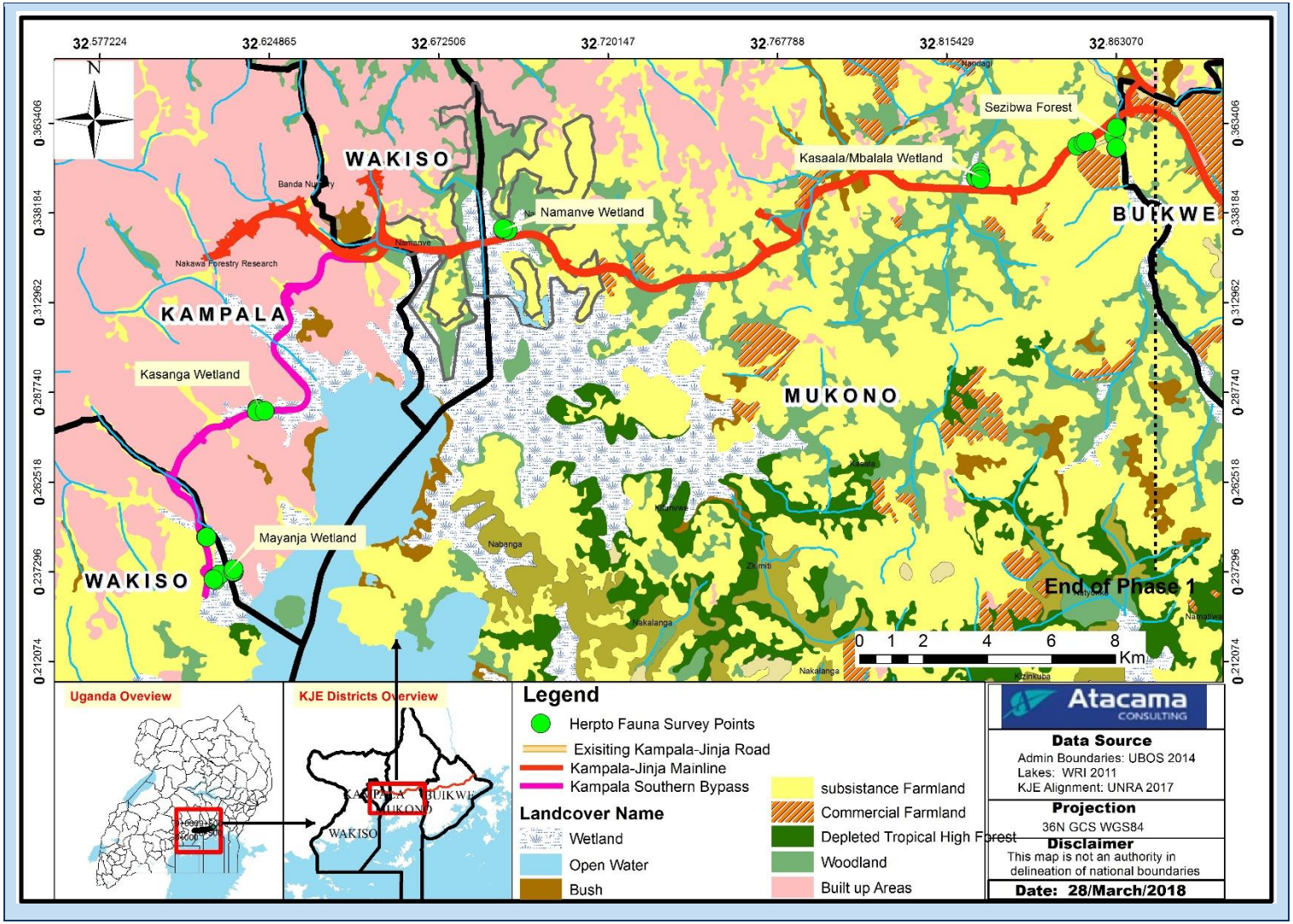

Figure 2.1 Survey points for herpetofauna along the Kampala-Jinja Expressway Phase 1

2.2 Survey Methods

Field surveys were undertaken in order to identify amphibians and reptiles within the habitats along the proposed KJE alignment. The survey team recorded all individuals observed with particular emphasis on species of conservation concern according to the IUCN Red List, and nationally threatened species for Uganda (WCS 2016, TBC 2016). The methods used during the field surveys were mainly Visual Encounter Surveys (VES) within 500 metres around a pre-geo-referenced point, and dip-netting. The encountered amphibians or reptiles were identified, and their reference points taken using a Garmin GPSmap 62sc.

Amphibia and reptilia are two distinct classes of vertebrates that are, for study purposes, often grouped together and named herpetiles (the study of herpetiles is herpetology). Herpetological surveys provided information on habitat quality (Appendix 1) and the environmental variables that control species diversity of the target taxa. The two key methods (VES and dip netting) were applied in these studies and their choice was determined by the behaviour of the target species and the nature of the habitat. However, their effectiveness depends on the weather conditions and the time of the day. The survey methods are further described below.

2.2.1 Literature Review

Prior to fieldwork, a literature review was carried out focusing on the study area, particularly habitat composition past and present, the distribution and diversity of the herpeto-fauna in the project area, and adjacent habitats and ecosystems.

2.2.2 Habitat stratification

The surveyed sites were stratified for ease of sampling. The key habitats surveyed for amphibians included lentic habitats, streams and vegetated wetlands. Suitable habitats for reptiles included rocky outcrops and woodlands/forests. Where relevant, edges of roads were carefully monitored for any sun-basking reptiles. The surveys focused on the Project footprint and areas within 500 metres around selected survey points within the Kampala-Jinja Expressway right of way.

2.2.3 Visual Encounter Surveys (VES)

Visual Encounter Surveys (VES) are a well-known and robust method for surveying herpetofauna. VES is similar to the Timed Constrained Count (TCC) method described by Heyer et al., (1994). They are used to document presence of amphibians and are effective in most habitats and for most species that tend to breed in lentic habitats. They generate encounter rates of species in their habitats in a unit hour. The method comprises moving through a habitat, turning logs or stones, inspecting retreats and watching out for and recording surface-active species. The data gathered using this procedure provides information on species richness of the habitat.

2.2.4 Dip-net sampling

A dip-net (Plate 2.1) was used to scoop through aquatic habitats to sample for aquatic species and for tadpoles. Specimens of aquatic species or tadpoles caught by this method, if not identifiable in the field, were preserved for later identification.

Plate 2.1 Sampling using dip net for aquatic herpetofauna

2.2.5 Opportunistic Encounters

Opportunistic records were those made outside the sampling points/hours but were found to occur in the surrounding area to be impacted by the project. Opportunistic records help complete the checklist of the animals as much as possible. Amphibians and reptiles are mobile and can be encountered outside their preferred habitats both spatially and temporally.

2.2.6 Species Identification and IUCN Red listing

Identification of herpetofauna followed Schiøtz (1999), Spawls et al. (2002, 2006) and Channing & Howell (2006). The Amphibia Web (2015) and The Reptile Database (Uetz & Jirí Hošek 2015) were also used. The conservation status of the herpeto-fauna followed the IUCN Red List (IUCN 2017) and the Ugandan Red List (WCS 2016).

2.2.7 Consultations with local community members

Local people who ascertained that they had stayed in the area for a long time (up to 10 years) and had been involved in activities such as farming and grazing in the area were consulted about the occurrence of reptilian species in particular.

2.2.8 Limitations

- Time limitations – a rapid assessment traversing vast areas and habitats was undertaken.
- Not all methods could be applied in every habitat. Thus, a few habitats with suitable multiple macro-habitats had combined methods applied such as VES and dip netting.
- There were no night surveys because most survey sites were within metropolitan areas and security was not guaranteed.

2.2.9 Laboratory analysis

Some laboratory analysis of samples was required where field identification was not possible. Specimens were collected, photographed and preserved for later identification at Makerere University Zoological Museum.

2.2.10 Data Analysis

Species accumulation curves, species diversity indices and cluster analysis were performed to predict species diversity of the sampled locations and important habitats for the amphibian and reptilian species. Cluster analysis is a class of statistical techniques that can be applied to data that exhibit "natural" groupings. Objects in a cluster are similar to each other. They are also dissimilar to objects outside the cluster, particularly objects in other clusters. The analysis was used to produce dendrograms which visually show the groupings produced.

3 RESULTS

3.1 Amphibian Distribution and Diversity

A total of nine amphibian species, belonging to six families and six genera, were recorded during the survey (Table 3.1 and Plate 3.1). Mayanja Wetland (Kabili-Kabwuma/Munyonyo) and Kasaala Wetland (Mbalala/Wankobya) had the highest diversity with seven species each, while Sezibwa forest and wetland (Lukonge) and Kansanga (Muyenga-Bukasa) had three species each. Only two species were recorded at the Namanve site. Pollution is likely to have influenced diversity, as the sites closest to the city had the poorest diversity while those further away, such as Mayanja (Kabili-Munyonyo) and Kasaala Wetland (Mabalala/Wankobya), were richer. However, the diversity could also have been influenced by the time of survey (see limitations).

Phrynobatrachus natalensis and *Ptychadena mascareniensis* were the commonest species recorded in all the five sites while *Amietophrynus regularis* was recorded in three sites and the rest of the species were recorded once or twice.

Table 3.1: Amphibian Species Richness of the Surveyed Sites along the KJE

Count of Amphibia	Site					
Amphibia	Mayanja Wetland (Kabili-Munyonyo)	Sezibwa Forest (Lukonge)	Kasanga (Muyenga Bukasa)	Namanve Wetland	Kasaala (Mbalala/ Wankobya)	Total
Amietophrynus regularis	1		1		1	3
Hoplobatrachus occipitalis	3				1	4
Hyperolius cinnamomeoventris					1	1
Hyperolius kivuensis	1				1	2
Hyperolius viridiflavus	1				1	2
Phrynobatrachus acridoides	1					1
Phrynobatrachus natalensis	1	1	1	3	2	8
Ptychadena mascareniensis	3	2	1	3	1	10
Xenopus victorianus		1				1
	11	4	3	6	8	32

Xenopus victorianus tadpoles at 484768 E, 40020 N

Amietophrynus regularis at 456555E, 26033N

Hyperolius viridiflavus at 456552N, 26034E

Hyperolius cinnamomeoventris at 480498N, 38634E

Phrynobatrachus natalensis at 465587N, 36849E

Hoplobatrachus occipitalis at 456555N, 26033E

Plate 3.1 Amphibian species observed with in the survey sites

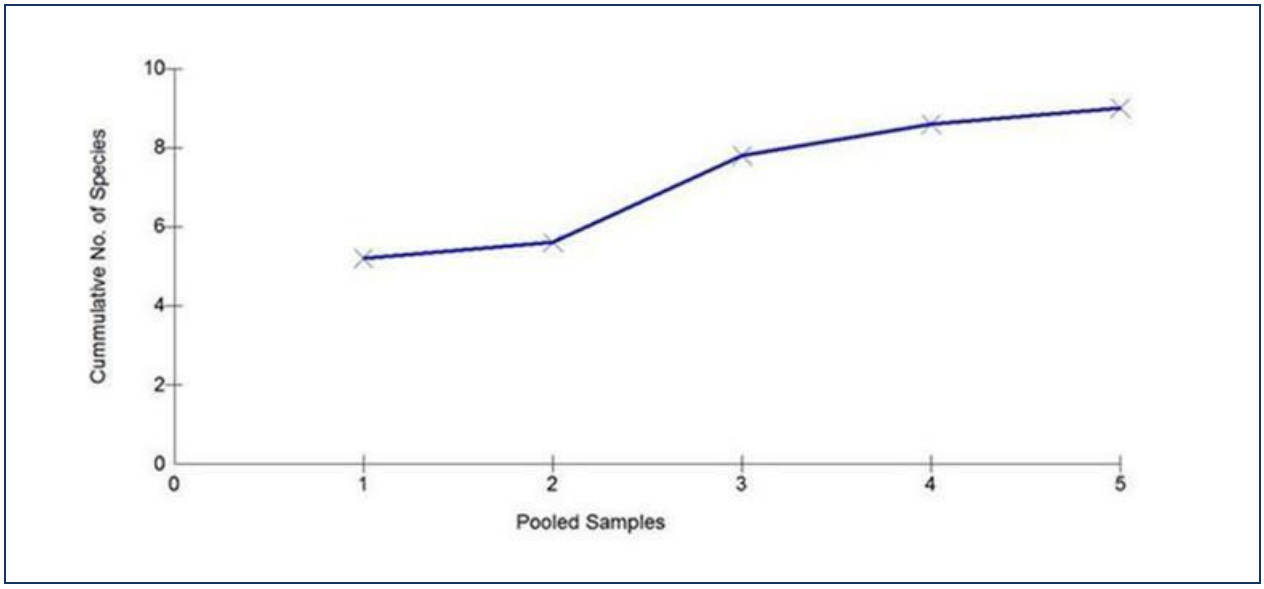

Figure 3.1 Species accumulation curve for amphibian fauna along the KJE

The species accumulation curve for amphibians (Figure 3.1) indicates that species diversity is greater than the nine species that were recorded, i.e. more species would be recorded given more survey sites and survey time, including at night and across different seasons. The species estimators Chao1, Chao2, Jacknife1 and Jacknife2 predict up to 13 species, but this is likely to be a minimal estimate.

Cluster analysis (Figure 3.2) shows the sites grouping together into two major groups: the Mayanja (Kabili-Munyonyo) and Kasaala (Mbalala/Wankobya) sites forming one group and are about 86%; and the Namanve and Sezibwa forest and wetland (Lukonge) pair, which are the most similar to each other (100%) linking up with Kansanga (Muyenga-Bukasa) at about 79.9%. However, note that all the sites surveyed are more than 79% similar, meaning that they have generally similar species composition for amphibians. What this analysis means is that Kabili-Munyonyo could be traded off for Wankobya site and vice versa if need arose that the expressway has to pass through one of the sites. Similarly, one of the sites - Lukonge or Namanve can be given up for the other, while the two combined can be traded off with the Muyenga-Bukasa site or vice versa. The analysis here gives us a practical example how to use biodiversity (amphibian) data to determine trade-offs or off-sets.

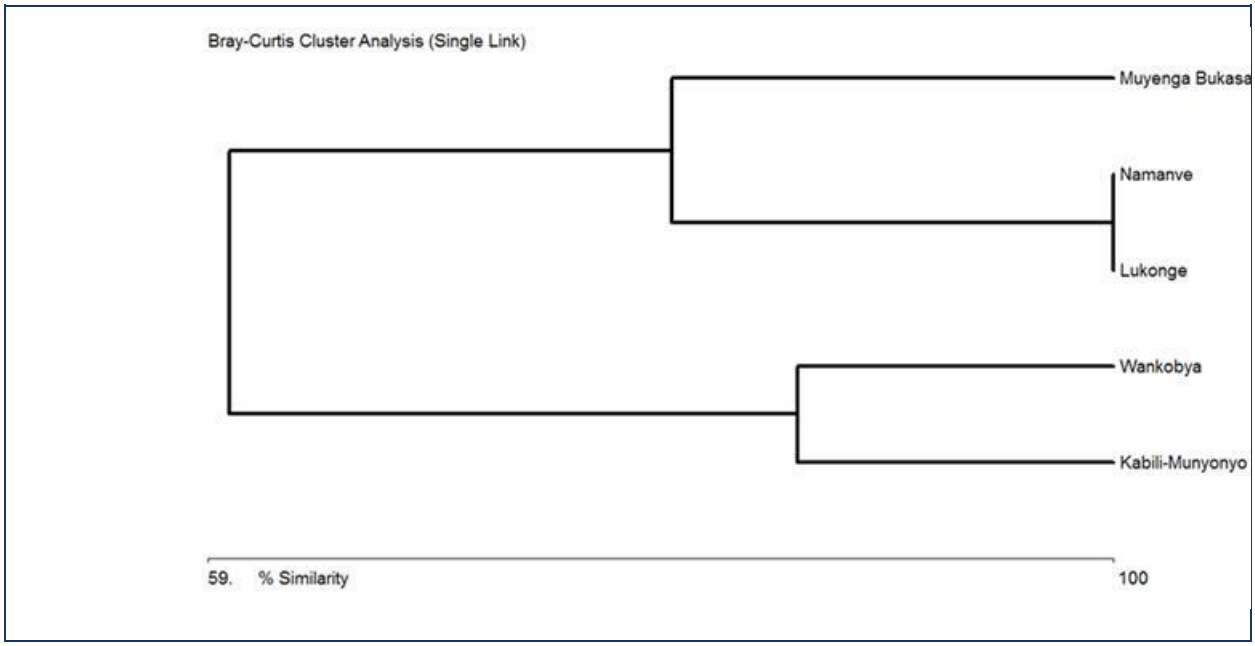

Figure 3.2: Dendrogram from a cluster analysis for amphibian fauna along the KJE alignment

Cluster analysis is useful in selecting offsets. Based on amphibian diversity data, Namanve can be traded off for Sezibwa (Lukonge) or vice versa and Kasaala (Wankobya) for Mayanja (Kabili-Munyonyo) or vice versa.

3.2 Amphibian Species of Conservation Concern

No species of conservation concern Regionally, Nationally or locally were recorded. All species were classed as Least Concern (Table. 3.2).

Table 3.2 Red-list status and proposed national status for Amphibian fauna Recorded in Sites along the KJE (LC = Least Concern)

Family	Species Name	Common Name	IUCN Global Status	Proposed National Status
Bufonidae	*Amietophrynus regularis*	Gutteral Toad	LC	LC
Dicroglossidae	*Hoplobatrachus occipitalis*	Crowned bullfrog	LC	LC
Hyperoliidae	*Hyperolius cinnamomeoventris*	Cinnamon-bellied Reed Frog	LC	LC
Hyperoliidae	*Hyperolius kivuensis*	Kivu reed Frog	LC	LC
Hyperoliidae	*Hyperolius viridiflavus viridiflavus*	Common Reed Frog	LC	LC
Phrynobatrachidae	*Phrynobatrachus acridoides*	Eastern puddle frog	LC	LC
Phrynobatrachidae	*Phrynobatrachus natalensis*	Natal snoring frog	LC	LC
Ptychadenidae	*Ptychadena mascareniensis*	Mascarene Grass Frog	LC	LC
Pipidae	*Xenopus victorianus*	Lake Victoria clawed Toad	LC	LC

3.3 Reptilian Distribution and Diversity

A total of 13 species, belonging to three orders Chelonii (turtles and tortoises), Sauria (reptiles with limbs) and Serpentes (the snakes), nine families and 11 genera, were recorded during the survey (Table 3.3 and Plate 3.2). Kasaala wetland (Mbalala-Wankobya) was the most species-rich site with eight species, followed by Mayanja Wetland (Kabili-Munyonyo) with seven species, Sezibwa/Lukonge with four species, and Namanve and Kasanga Wetland (Muyenga) with two and one species respectively. This is a similar pattern as observed for the amphibians, although some sites had more individuals of the same species recorded in them than others.

The most common species were the water cobra (*Naja melanoleuca*), recorded at four of the five sites, and the blue-headed agama (*Acanthocercus atricollis*) and hissing sand snake (*Psammophis sibilans*), each recorded at three of the five sites. Most other species were recorded once or twice during the entire survey.

Table 3.3: Reptilian Species Richness of the Surveyed Sites along the KJE

Count of Reptiles	Site name					
Reptiles	Mayanja Wetland (Kabili-Munyonyo)	Sezibwa forest (Lukonge)	Kansanga wetland (Muyenga Bukasa)	Namanve wetland	Kasaala wetland (Mbalala-Wankoba)	To tal
Typhlops lineolatus					1	1
Acanthocercus atricollis		2		3	2	7
Bitis nasicornis		1				1
Bitis arietans					1	1
Dendroaspis jamesonii	1					1
Pelomedusa subrufa		1				1
Naja melanoleuca	3		1	1	1	6
Philopthamnus semivariegatus	1				1	2
Psammophis sibilans	1	2			1	4
Python sebae	1					1
Trachylepis maculilabris	1				1	2
Trachylepis striata					1	1
Varanus niloticus	2					2
Total	10	6	1	4	9	30

Trachylepis maculilabris at 457141N, 26309E

Acanthocercus atricollis (male) at 465587N, 36849E

Varanus niloticus at 456705N, 26142E

Plate 3.2 Reptiles observed in the surveyed sites

The species accumulation curve for the reptilian fauna shows a steeply rising curve (Figure 3.3). The species estimators Chao1, Chao2, Jacknife1 and Jacknife2 indicate that between 13 and 29 reptile species are predicted for the area, with Chao2 predicting the highest diversity (29 species) followed by Jacknife1 (19 species) and Jacknife2 (23 species).

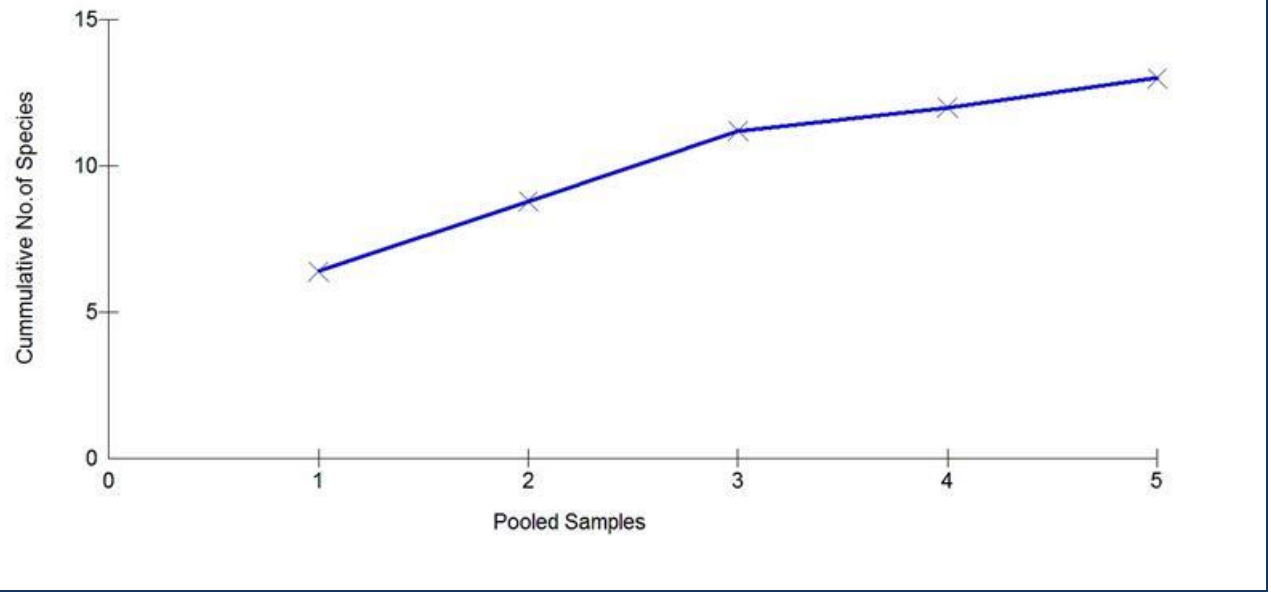

Figure 3.3: Species accumulation curve for reptilian fauna along the KJE alignment

Cluster analysis (Figure 3.4) shows that Kasanga (Bukasa-Muyenga) and Namanve wetland were the most similar sites (66.9%), Kasaala (Mbalala/Wankobya) and Mayanja (Kabili-Munyonyo) were 53% similar, and Sezibwa (Lukonge) was only 33% similar to the other sites. However, all the sites are in one hierarchical order.

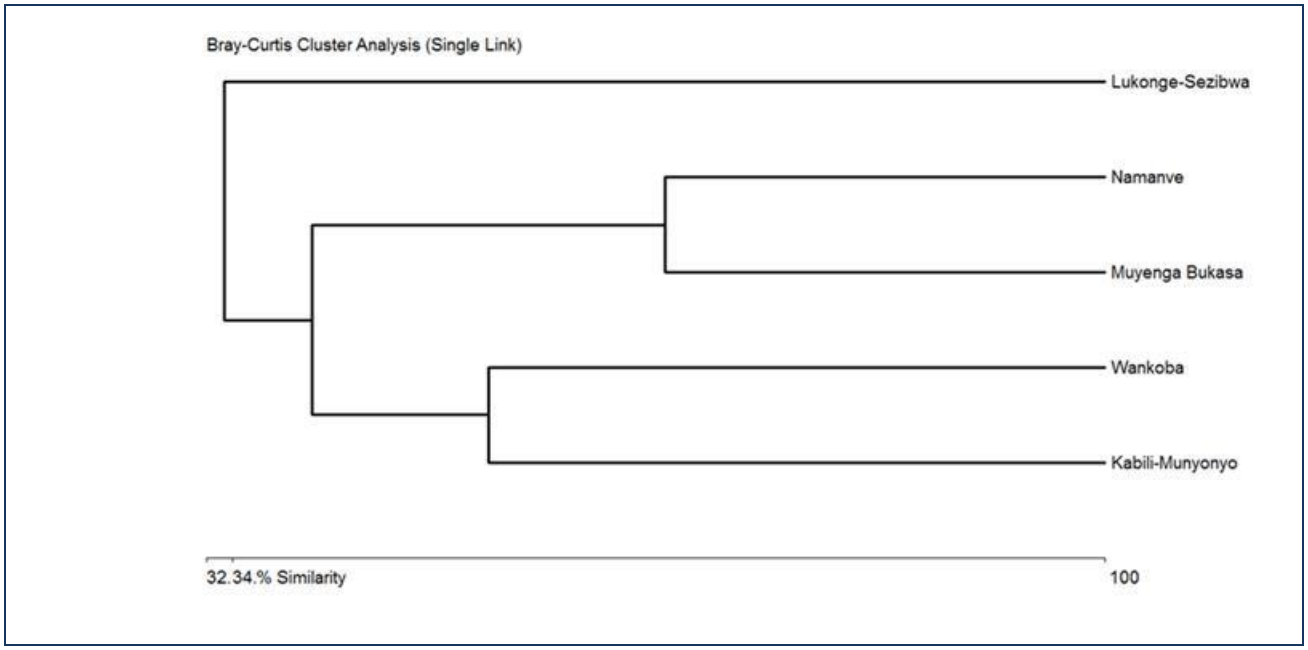

Figure 3.4: Dendrogram from a cluster analysis for reptilian fauna along the KJE Alignment

3.4 Reptile Species of Conservation Concern

There was no reptile species of conservation concern recorded in the project area, although the international conservation status of some species recorded have not been evaluated by the IUCN (Table.3.4). According to IUCN (2017), the Nile monitor (*Varanus niloticus*), variegated bush-snake (*Philothamnus semivariegatus*), hissing sand snake (*Psammophis sibilans*), African python (*Python sebae*), Jameson's mamba (*Dendroaspis jamesonii*), forest cobra (*Naja melanoleuca*), puff adder (*Bitis arietans*) and rhinoceros viper (*Bitis nasicornis*) are all Not Evaluated (NE). The National Red List (WCS, 2016) categorizes them as LC (Least Concern).

Table 3.4: IUCN Redlist status and proposed national status for Reptilian Species Surveyed in Sites along the KJE Alignment

Order	Family	*Species*	Common Name	IUCN Status	Proposed Status (Uganda)
Chelonii	Pelomedusidae	*Pelomedusa subrufa*	Side-hinged tortoise	LC	LC
Sauria	Agamidae	*Agama atricollis*	Blue-headed agama	LC	LC
Sauria	Scincidae	*Trachylepis maculilabris*	Speckle-lipped skink	LC	LC
Sauria	Scincidae	*Trachylepis striata*	Three-lined mabuya	LC	LC
Sauria	Varanidae	*Varanus niloticus*	Nile monitor	NE	LC
Serpentes	Typhlopidae	*Typhlops lineolatus*	Lineolate blind snake	LC	LC
Serpentes	Colubridae	*Philothamnus semivariegatus*	Variegated bush-snake	NE	LC
Serpentes	Colubridae	*Psammophis sibilans*	Hissing sand snake	NE	LC
Serpentes	Boidae	*Python sebae*	African python	NE	LC
Serpentes	Elapidae	*Dendroaspis jamesonii*	Jameson's mamba	NE	LC
Serpentes	Elapidae	*Naja melanoleuca*	Forest cobra	NE	LC
Serpentes	Viperidae	*Bitis arietans*	Puff adder	NE	LC
Serpentes	Viperidae	*Bitis nasicornis*	Rhinoceros viper	NE	LC

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5 APPENDIX

Appendix 1: Habitat-Quality Assessment

	Namanve Wetland	Kasaala Wetland (Mbalala/Wankobya)	Sezibwa Forest (Lukonge)	Mayanja Wetland (Kibili – Munyonyo)	Mayanja Wetland (Kabuma-Munyonyo)	Kansanga (Muyenga-Bukasa)
Date	21/12/2017	22/12/2017	22/12/2017	23/12/2017	23/12/2017	23/12/2017
Location of survey points	36N, 465717E, 36836N	36N 480499, 38635	36N, 480499E, 38635N	36N, 456552E, 26034N	36N 456552E, 26034N	36N, 457866E, 31200N
Coverage of natural habitat	60%	65%	65%	50%	67%	35%
Habitat types	Reclaimed edges	Fragmented forest	Permanent wetland dominated by papyrus	Cultivated permanent wetland	Permanent wetland	Degraded permanent wetland
Habitat types	Riverine forests				Degraded zone	
Dorminant flora	*Croton macrostachus*	*Terminalia*	*Cyperus*	*Phragmites*	*C.papyrus*	Elephant grass
Frequent	Ferns		*Eichornia*	*Papyrus*	*Phoenix*	*C.papyrus*
Occasional	*Phoenix reclinata*				*Eichornia crassipes*	
Rare	*Myrianthus holsti*	*Sapium elipticum*		*Croton macrostachus*		*Croton macrostatachus*
Wildlife sighted	*Xenopus victorianus, Ptychadena mascareniensis*	*Blue headed agama, Ptychadena mascareniensis*	*Xenopus, Varanus, Ptychadena mascareniensis, Herperolius*	*Ptychadena mascareniensis*	*Holobatrachus occipitalis, Hyperolius kivuensis, Varanus niloticus*	*Blue headed agama, Ptychadena mascareniensis*
Estimated coverage of degraded habitat	40%	35%	30%	48%	35%	75%
Evidence of existing threat to habitat quality	Present	Present	Present	Present	Present	Present
Presence of cultivated land	Yes	Yes	Yes	Yes	Yes	Yes
Dorminant	Sugar cane, banana, cassava	Coffee	Yams	Rice	Bananas	Bananas
Occasional		Maize	Sugar cane	Sugar cane		Sugar cane
Rare	Cabbage	Potatoes		Yams		Maize
Presence of alien species	No	*Lantana camara*	*Elchonia crassipes*	Yes	*Elchonia crassipes*	No
Evidence of clay collection or brick making	None	N/A	Yes	None	Heaps of bricks and brick makers found on site	N/A

	Namanve Wetland	Kasaala Wetland (Mbalala/Wankobya)	Sezibwa Forest (Lukonge)	Mayanja Wetland (Kibili – Munyonyo)	Mayanja Wetland (Kabuma-Munyonyo)	Kansanga (Muyenga-Bukasa)
Habitat clearance for developmen tof fish ponds	None	N/A		None	A lot of ponds with fish fries are present on site	N/A
Evidence of papayrus collection	None	N/A		No	Sprouting papyrus stumps may be a sign of papyrus collection	Found a woman cutting, for making papyrus mats
Timber collection	Forest is concentrated along the stream	Timber trees absent, few trees of mature size dbh greater than 40cm		No timber woodland or forest		N/A
Roads/trucks/access routes		Access routes present including those used by the communities to collect fire wood		Access roads ends at the periphery	Express highway, the papyrus dominated habitat is inaccessible due to higher moisture content	Access routes present including those linking to planted crops
Presence of refuse tips		N/A	no	No		Yes
Description	Bottles at the edge and in water but not intense	N/A		None		Disposal wastes present, Bad smell from organic wastes
Signs of pollution	Agro-chemicals bottles, herbicide spraying uphill probably ends up in the river/stream	N/A		No	N/A	Bad smell from organic wastes
Enchroachment of housing	None	Yes		Yes		Yes
Evidence of hunting	None	N/A		None	Hunting reported by the local guide. Hunters also encountered preparing to hunt sitatunga in wetland	N/A
Others						
Photos						
Additional notes if required		The fragmented forest is part of the Sezibwa forest but lacks connectivity to river because surrounded by agriculture		Higher bird population that preys on frogs		The entire wetland is heavily degraded by human and plastic waste

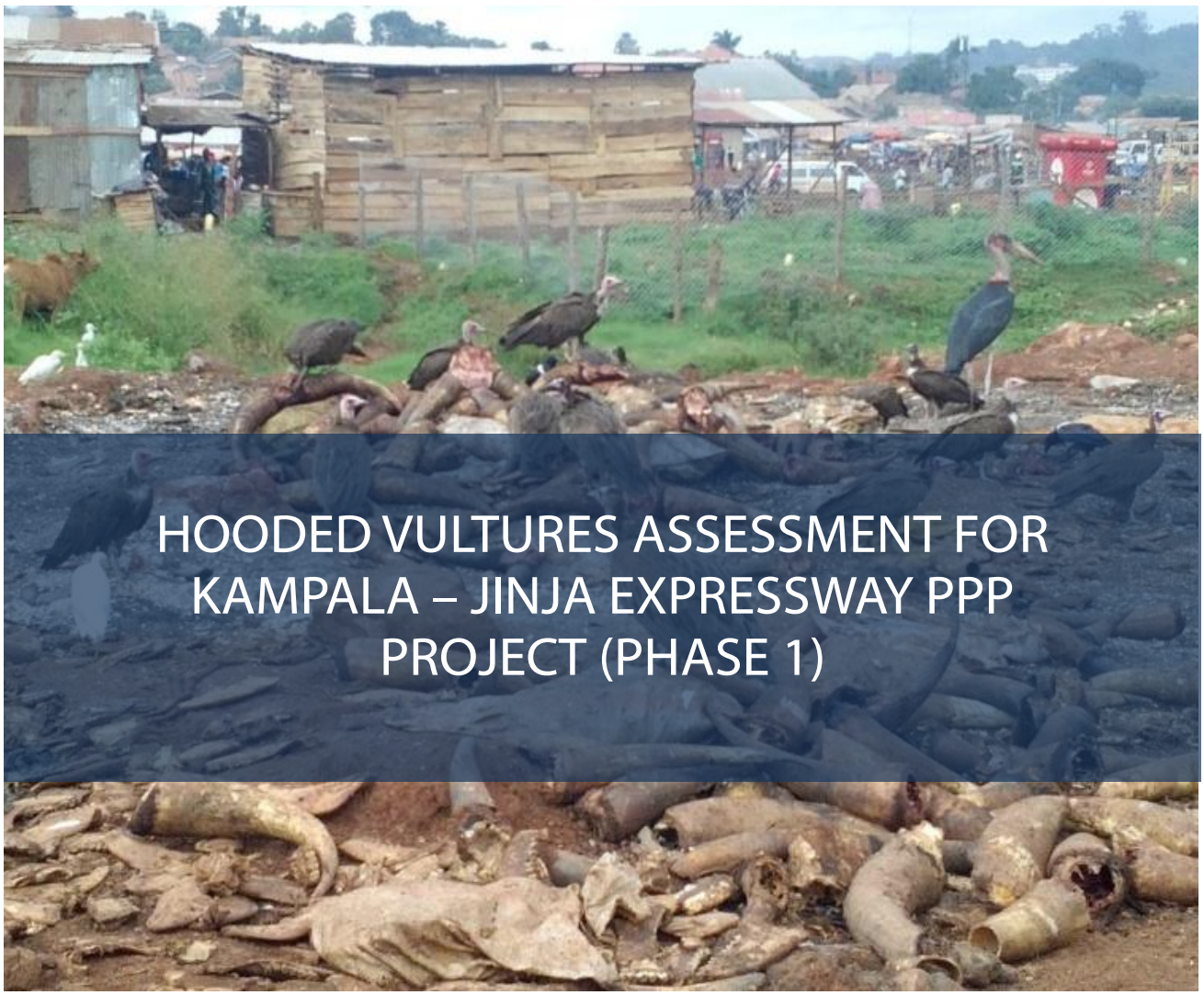
Appendix 2: Habitat-Quality Photos

	
Cattle grazing in Namanve wetland (465717 E. 36836N)	Climbers in the transition between the typical grassland and *Phoenix reclinata* dominated wetland at Namanve site (480373 E. 38478 N)
	
Sugarcane growing In Namanve wetland (465717 E. 36836N)	Exotic Canan lilly ornamental plant in open area of Namanve wetland (480373 E. 38478 N)
	
Wankoba wetland degradation by Eucalyptus (480480 E. 38607N)	Sand mining access routes in Wankoba wetland (480480 E. 38607N)

	
Weeds dying due to herbicide application – such herbicides are potential pollutants for the river.	Brick making in Kibili wetland (456276 E. 27306 N.)
	
Sprouting papyrus vegetation and evidence of papyrus collection and cutting (457133 E. 26232 N.)	Sugar cane and banana plants and evidence of agricultural crop production in Kibili wetland (457142 E. 26205 N.)
	
River cutting through Kibili wetland towards Lake Victoria (457058 E. 26218N)	Evidence of invasive weedy exotic species occupying Kibili wetland; *Eichornia crassipes* (456204 E. 27360N)

	
Destruction of Kabuma and encroachment of Kibili wetland by expanding urbanisation and settlement (456249 E. 27328N)	Waste disposal in the middle of the Kabuma wetland (456286 E. 27297N)
	
Struggling, drying, overgrown Eucalyptus seedlings planted along the stream in Kabuma wetland (456236 E. 27309 N)	Sugarcane and Eucalyptus trees planted in Kabuma wetland (456191 E. 27366 N.)
	
Muyenga Bukasa wetland, overlooked by houses (458112 E. 31224 N.)	Muyenga-Bukasa wetland – field being prepared for rice growing. 75% of the wetland is being cleared for rice growing (457884 E. 31296 N.)

	
Stream of water in mildly degraded Muyenga Bukasa wetland; potential breeding ground for frogs (456296 E. 27305 N.)	Bush burning at the wetland periphery is a hazard to subterranean organisms including amphibians (456296 E. 27305 N.)



HOODED VULTURES ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

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DOCUMENT CONTROL

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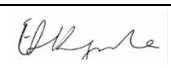
Approver	Edgar Mugisha	ESIA Team Leader		24/04/2018	4

TABLE OFCONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

HOODED VULTURES ASSESSMENT FOR KAMPALA – JINJA EXPRESSWAY PPP PROJECT (PHASE 1)

1 INTRODUCTION

The Hooded Vulture *Necrosyrtes monachus* is an African endemic that is currently globally Critically Endangered (IUCN, 2018). This Vulture is a generalist scavenger in urban centres utilizing all kinds of wastes associated with humans including human excrement, carcasses, meat offal, bones and fresh meat associated with abattoirs (Brown *et al.* 1982). The species provides essential ecosystem services (Ogada *et al.* 2012) through consuming organic matter that would rot and cause unhygienic conditions that could breed disease to man and wildlife (Chemonges 1991).

African vultures including the Hooded Vulture are generally facing a range of threats, including poisoning, trade in traditional medicine, electrocution (Ogada. *et al*. 2014). Other threats may include reduction of habitat, disturbance of nest site and food decline (Monadjem *et al*. 2005).

1.1 Objectives of the Study

The main objective of this report was to provide assessment of the Hooded Vulture population status at known Hooded Vulture roosting and feeding sites in and around Kampala and Mukono districts.

Specific objectives were:

- To assess the number of Hooded Vultures at known roasting and feeding sites in and around Kampala and Mukono Districts;
- To assess the population trends of Hooded Vultures in and around Kampala and Mukono Districts; and
- To assess presence of any breeding sites for Hooded Vultures in and around Kampala and Mukono District.

1.2 Study Methodology

1.2.1 Study area

The study was conducted in the Kampala area including Entebbe and Mukono town. Data was collected from major abattoirs and dump sites within the studied towns.

1.2.2 Data collection

Data was collected by total counting method (Bibby *et al*. 2000) using a pair of binoculars, a Camera and data collection forms.

The sites in Kampala were visited once every month from January 2016 to February 2018 under Kampala Hooded Vulture monitoring scheme by Micheal Kibuule. Sites in Mukono and Entebbe were visited four times in different months between 2016 and 2017 by the same person.

1.2.2.1 Total Counts at Feeding sites

Observations were taken from vantage points at abattoirs and dumpsites (Plate1.1) such that all individuals were recorded. The duration of every count was limited to one hour so as to minimize errors which would arise as a result of double counting. Counts were conducted between 0700hr to 1000hr since this is the known peak foraging time for raptors (Henrique *et al*. 2017, Pomeroy *et al.* 2014). Birds which arrived after the beginning of a count were included as well.

Plate 1.1: Hooded Vultures at a feeding site at Kalerwe abattoir, Kampala.

1.2.2.2 Total counts at roost sites

Roost counts were conducted in the evenings from 1800hr to 1930hr on the same day feeding time counts were conducted. All roost site apart from one (Entebbe roost) were located along electric pylons. Birds were recorded by walking along the line until all roosts were counted.

Plate 1.2: Roosting Hooded Vultures at City abattoir, Kampala.

2 RESULTS

2.1 Population of Hooded Vulture in and around Kampala

Considering counts at roost time, the population of Hooded Vultures in Kampala is at least 196 individuals. However, supplementary data collected at feeding time is rather low (153 individual). Majority of Hooded Vultures in Kampala area forages and roost at City abattoir followed by Kyengera abattoir (Table 2.1). However, other sites indicated in Table 2.1 are as well important for the conservation of Hooded Vultures.

Table 2.1: Number of Hooded Vultures at the six studied sites in Kampala and nearby towns

Sites	Location UTM 26N WGS84		Town	Survey time [a]	
	Easting	Northing		Feeding time	Roost time
City abattoir	35285	455828	Kampala	104	131
Kyengera abattoir	445854	33194	Kampala	21	31
Kalerwe abattoir	451655	39644	Kampala	20	0
Kiteezi Landfill	451903	44834	Kampala	8	34
Entebbe abattoir	441458	007799	Wakiso	29	16
Seeta abattior	468583	41401	Mukono	4	2

Note: 'a' means that numbers shown in the table are average numbers

Kiteezi landfill is the only rubbish dump site that harbors Hooded Vultures; other rubbish dumps in Kampala and nearby towns harbors scavengers other than Hooded Vultures. This indicates the importance of abattoirs in the conservation of this species. Figure 2.1 shows that generally roost time counts yields higher numbers than feeding time counts.

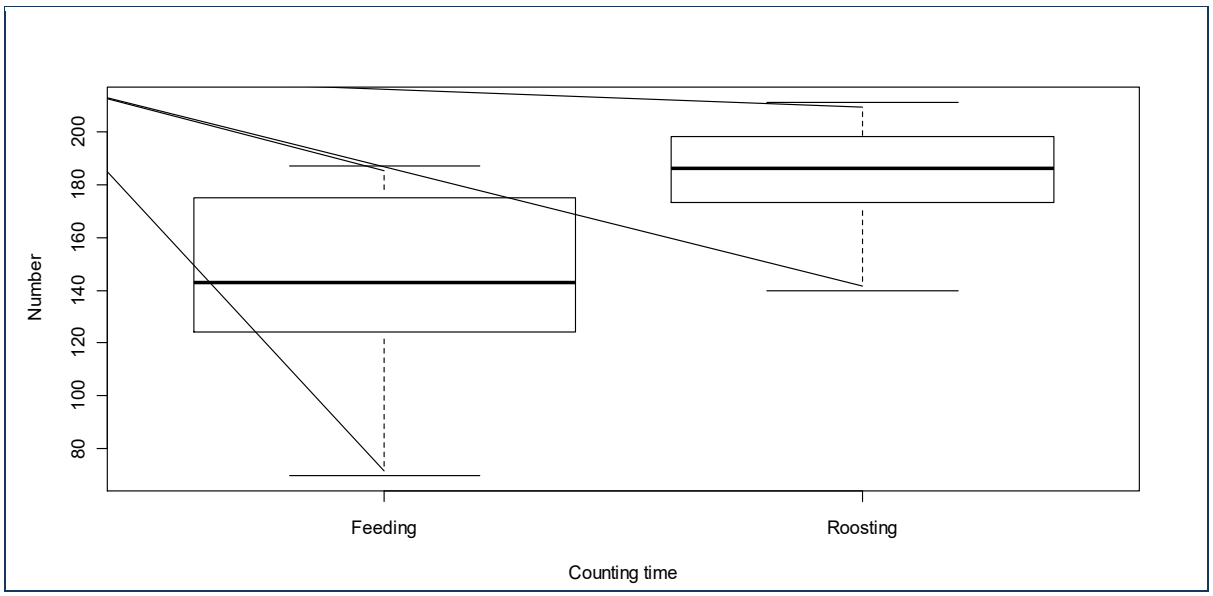


Figure 2.1: Box-plot of average number of individuals recorded during feeding and roost time in Kampala. Thick lines are median values, boxes show inter-quartile ranges, dotted lines show minimum and maximum values.

The roost time count method can therefore be taken to be a more appropriate method in estimating Hooded Vulture population compared to the feeding time count method.

2.2 Hooded Vulture Population Trend in and around Kampala

Initial assessments were conducted in the early 1970s (Ssemmanda *et al*. 2010). There was a positive trend in the numbers of Hooded Vulture between 1970 and 2004 (Figure 2.2). However, the population started to decline after its peak in 2004.

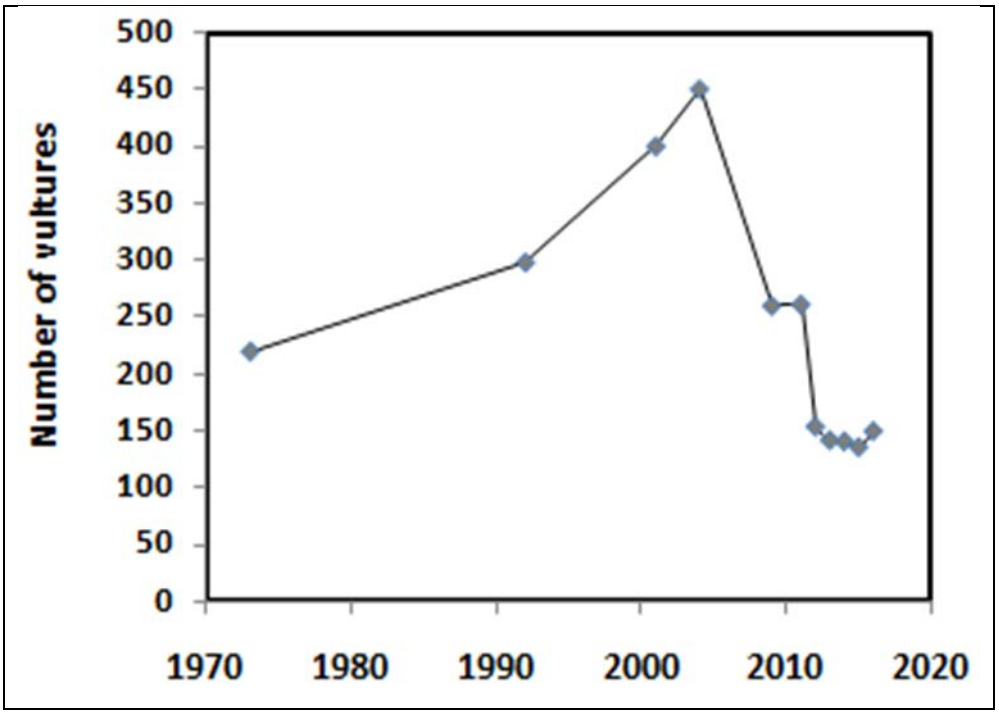


Figure 2.2: Hooded Vulture population trends in Kampala (historical data was adapted from Ssemmanda *et al.* 2010).

Generally, there has been a declining trend in the population since 2004. It is important to note that the current population in Kampala alone is less than a half of the numbers recorded in 2004.

2.3 Seasonality in Numbers of Hooded Vultures in and around Kampala

Monthly assessments suggest fluctuations in numbers recorded between months (Figure 2.3). Lower numbers were recorded in dry periods which are also breeding months (October- June) and higher numbers were recorded during wet months when food for scavengers is expected to be scarce.

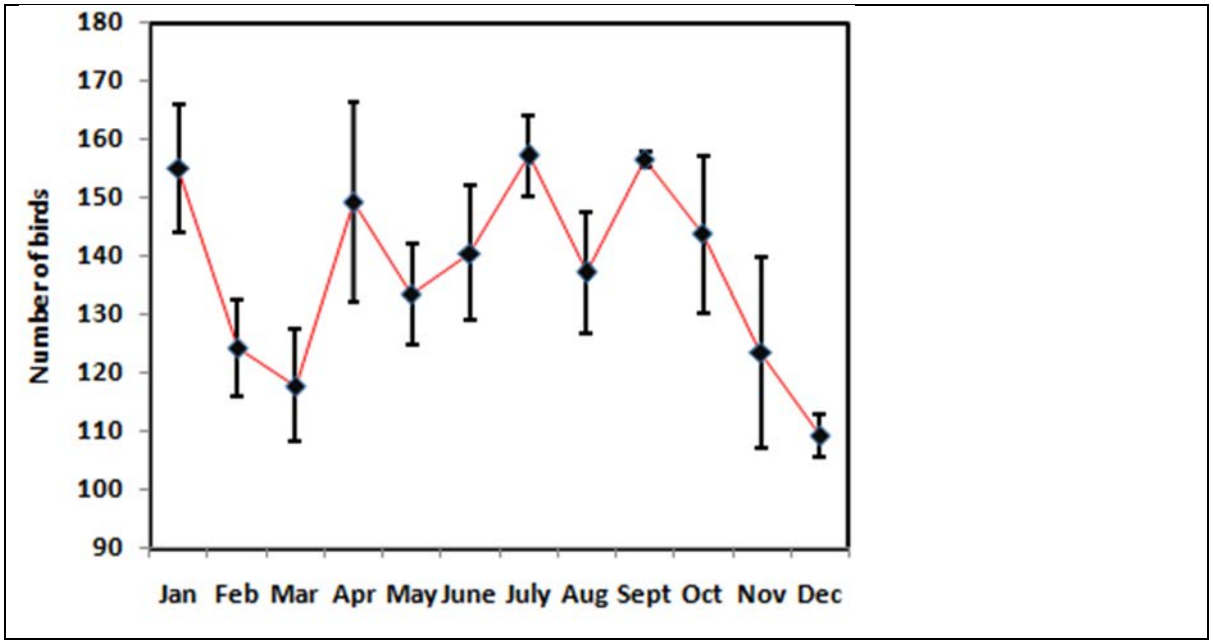


Figure 2.3: Monthly numbers Hooded Vulture numbers in Kampala (this figure was constructed based on data collected during feeding time).

2.3.1 Breeding of Hooded Vultures in and around Kampala

Reproductive activity is overall very poor in the Kampala area; the study recorded three breeding pairs. Interviews with members of the local community about the existence of known Vulture nests did not produce any positive results. The breeding pairs were found opportunistically during the course of nest searches around feeding and roost sites.

Table 2.2: Results from the breeding colony

Tree species	DBH (cm)	No. nest	Height to nest (m)	Nest position	Coordinates
Pinuspinus	30	1	8	below canopy	36N 0457714, 0034655
Milicia excelsa	30	1	9	below canopy	36N0457547, 0034597
Eleisguineisis	35	1	7	below canopy	36N0457570, 0034685

One breeding site was identified with 3 nests present. The breeding site was located about three kilometres from City abattoir in Kampala at Bugoloobi (36N0457714 0034655). All nests were situated

below the canopy along the main trunk. The height of the nests ranged from 7-9 m (Table 2.2) and the average DBH of the trees with nests was 31.7cm (Pate2.1). Number of nest per tree was one.

Plate 2.1: One of the Pinuspinus nesting trees with an adult standing above the nest.

The density of hooded vulture nest was 16.7/km (3 nests/0.18km). The mean distance between nests was 0.143 km with greatest distance being 0.18km and the nearest being just 0.11km apart.

3 DISCUSSION

3.1 Population of Hooded Vultures in Kampala area

The population of Hooded Vultures in Kampala area is relatively lower compared to other Cities especially in West Africa (Henrique *et al.* 2017). In fact, the population trend since 2004 is declining. For example, Ssemmanda *et al.* (2010) reported this population had suffered a 48% decline from 2005 to 2009. In addition, Pomeroy *et al.* (2014) reported that the population in Kampala had reduced to about 100 in 2014. Similarly, the findings of this study suggest that the population declined by 40% over the last ten years.

Anthropogenic factors could be the major factors responsible for such trends. The major factor could be habitat modification as a result of urbanization. Infrastructure development usually result in cutting down of nesting and roosting tree which are important for the survival of the species. Other factors could be high demand of the species for traditional beliefs, competition with other scavengers and humans, electric collisions, poisoning and stone throwing.

According to Ssemanda (2005) Kampala was the stronghold of Hooded Vultures in Uganda, this shows how important Kampala area is to the Hooded Vultures and how critical it to protect this critically endangered species in such a changing environment.

In a recent companion study, about Hooded Vultures in Uganda by Micheal Kibuule (un published data), the species does not occur in every town in Uganda. However, more individuals were recorded in towns with higher human population, making human population a significant determinant of Hooded Vulture presence. Towns such as Jinja, Masaka, Mityana and Masinda had quite a good number of individuals. However, there were no records of occurrence from towns in the western region.

The population of Hooded Vultures in protected area is sparsely distributed. For example, Pomeroy *et al.* (2014) reported a 0.5 birds $100km^{-1}$ encounter rate on roads in Uganda's protected areas.

3.2 Breeding population

Information available on nesting by the species are very anecdotal, for example in early 2000s, Roger Skeen (pers.com) recorded two nests in Namuwongo, a Kampala suburb. However, nest surveys indicate the size of the breeding population, and hence yield an important measure of local status of the species (Pomeroy *et al*. 2014). Information relating to breeding and breeding sites of Hooded Vultures in Kampala and Uganda is still largely unknown (Ssemmanda and Plumptre, 2011).

This study discovered one breeding site at Bugoloobi, a few kilometres from City abattoir, the site had three completely built nests; a fourth nest fell down before it was completely built as a result of a heavy rains.

The habitat is built-up environment. Nesting trees were located on private land. Each nest was on a different tree and each located at a distance of 0.14km from each other. The wide spacing of nests suggests that the species may be territorial (Bird Life International 2018). All nests were made of a stick platform placed beneath the canopy but near the main trunk of the nesting tree; this may have given nests some protection from ground predators and also making ground surveys more efficient that aerial surveys in case of Hooded Vulture (Monadjem and Garcelon 2005).

The number of adults at the nest was usually one as this would suggest cooperative breeding (Houston 1974). This study did not determine nesting success, but it was recorded as 0.54 offspring per year by Hustler and Howell (1988) in Zimbabwe. According to Houston (1988), the young are most likely to survive if they are released from the nest when food is most abundant, therefore breeding success could be directly related to food abundance (Lack 1954).

4 RECOMMENDATIONS

Kampala area is the stronghold of Hooded Vultures in Uganda and they are mainly harbored around abattoirs and dumpsites. In fact, the only breeding record of the focal species is in Bugoloobi a Kampala suburb. Therefore, these sites need to be protected. We therefore recommend that precautionary environmental measures be considered for any development around abattoirs and breeding sites.

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