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ABUNDANCE AND DISTRIBUTION OF WOODLAND KINGFISHER (*Halcyon senegalensis*) IN THE UNIVERSITY OF IBADAN, SOUTHWEST, NIGERIA

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ABSTRACT

This study was carried out to assess the abundance and distribution of the woodland kingfisher (*Halcyon senegalensis*) in the University of Ibadan. Point Count Method was used in the survey. Three landuse types namely, Residential, Aquatic and Forest area were selected, and 15 points were marked with 100 m apart on each area with the aid of GPS. Calls, sightings of bird and the position sited (tree, shrub and grass) were recorded within a 30 m radius for five minutes on each point between (08: 00hrs) and (19:00hrs) for 3weeks using standard procedure. Data was analysed using descriptive statistics and ANOVA at $\alpha < 0.05$. A total of 265 individuals were encountered. Residential area had the highest population of 120 (45.3%), followed by aquatic area 105 (36.6%) and 40 (15.1%) at the forest area. The mean frequency is highest in residential area (7.67), followed by aquatic area (7.00), but least in forest area (2.67). There was significant difference ($P<0.01$) in the distribution of the Woodland Kingfisher across the different sites. The abundance of Woodland Kingfisher is significantly different from the aquatic landuse type and forest landuse type. However, there was no significant difference between the aquatic area and forest area.

Keywords: Species abundance; wildlife distribution; landuse types; woodland Kingfisher

INTRODUCTION

Generally, Kingfishers are widely spread across Africa and other continents. They are small to medium sized bird with about 87 species of which 16 are found in Africa (Hocney, 1997). The woodland Kingfisher is found in Nigeria and other African countries that are south to the Sahara. They are from the family Alcedinidae with three recognized subspecies (Frank and David, 2017) namely, *Halcyon senegalensis fuscopileus* which is found in Nigeria, *Hacylon senegalensis senegalensis* (Linnaeus, 1766) and *Halcyon senegalensis cyanoleuca* (Vieillot, 1818).

According to Birdlife International (2022), Woodland Kingfisher occupies an exceedingly wide range of habitat as a result, they do not fall under the vulnerable criterion. This, however, may be the reason for the limited research on the species. Avifauna conservation is a major part of biodiversity conservation regardless of their IUCN status because of the immense role they play in the ecosystems. Birds gives signals about the health

condition of the microclimate, and they are the first set of animals that will migrate from a habitat when they sense any form of threat in the environment. This is why they are called biological indicators. An area with more bird species abundance and richness is meant to be ecologically viable than an area with poor or low bird species richness. This is because the condition of the habitat with more bird species is better, hence it appeals to more species.

Birds have a wide range of attributes that makes them more efficient in providing many valuable ecosystem services. Due to their mobile nature, birds connect habitats in a landscape, and contribute to ecosystem functions and resilience through their foraging and seed dispersal behavior. Seed dispersal is fundamental to species diversity, species distributions, population dynamics and gene flow. Birds disperse seeds of many woody plant species with direct value to humans for timbers, medicine, food and other uses.

The most critical threat facing wildlife (birds inclusive), is the destruction and fragmentation of habitat (Lateef *et al.,* 2015: Olajesu *et al.,* 2019). Over the last century, human activities have led to the extinction of many bird species. Some of the major reasons for the extinction of bird species are habitat loss due to anthropogenic activities, over exploitation, accidental mortality from structural collisions, pollution, oil spill and pesticides use (Pearsons *et al.,* 2006). Since the Woodland Kingfisher has been reported to be found around open savannas, forest fringes and clearings, it means that to an extent, the species can tolerate some level of environmental change. However, some changes can be detrimental if it's a continuous change that can lead to major fragmentation and pollution.

The loss of forests, plains and other natural systems to agriculture, mines, and urban developments, the draining of swamps and other wetlands, and logging reduce potential habitat for many species. Thus, the need to assess the abundance and distribution of the kingfisher, its activities and vegetation for proper management of this bird species in their habitats.

MATERIALS AND METHOD

Study Area

University of Ibadan is located in Ibadan, the capital city of Oyo state. Oyo state is located in the Southwestern part of Nigeria. University of Ibadan is situated 6 km to the North of the city of Ibadan and covers over 2,550 acres of land. It is located on Latitude 7^0 26''North and Longitude 3^0 54''East at a mean altitude of 277 m above sea level. The University of Ibadan started off as the University College, Ibadan (UCI) which was founded in 1948.

The topsoil is freely drained, fairly acidic and of moderate fertility with colluvial deposits in the valley. The geology of the area is underlined by rocks of basement complex, mostly gneiss. The University of Ibadan is located in the Northern limit of lowland rainforest zone. It lies in a transitional zone between the rainforest and derived savannah zone with annual rainfall of about 1220mm of double peak during June and August which last for almost 8 months (April to October) and dry season between November and March.

The vegetation of the area is rich with highly diverse species comprising of a wide variety of woody trees, shrubs, collection of herbs, palms and climbers which are well represented (UI. Handbook, 2011).

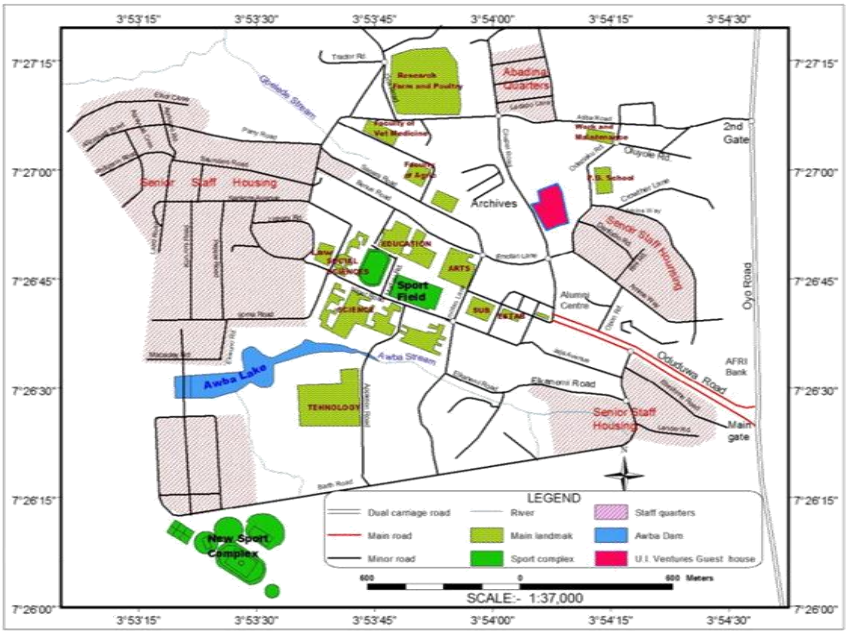

Figure 1: The map of the University of Ibadan campus

Method of Data Collection

Point count method was used to assess the abundance and distribution of the woodland kingfisher in the University of Ibadan. The point count method is one of the most widely used methods for taking censuses of bird populations (Rosenstock *et al.* 2002; Simons *et al.* 2009). A point count involves a period of time during which an observer records the auditory and visual signals of the individuals on predetermined locations.

There are many factors that can affect the probability of correctly detecting birds during the point counts (Simons *et al.* 2009). In order to resolve this problem, in part, standardized methods were used to perform point counts (Rosenstock *et al.* 2002): low wind levels and rainfall, calibration of observers, and surveys carried out early in the morning (08:00 – 10:00hrs) when the birds 'singing activity is at its most intense. The environmental conditions at the time of point counts are therefore quite similar from one study to another. The first step in the procedure was the stratification of the university community based on the land use types. Three land use types were identified for this study namely:

- Residential areas
- Forest areas
- Aquatic areas

For this study, a total of fifteen points were marked with the aid of a Global positioning system (GPS) in each of the three (3) land use types. Calls and sightings of birds were recorded within a 30 meters' radius for a period of five (5) minutes for each of the 15 points. The distance between any two points was 100 meters.

The activities of the birds were also taken into consideration as well as the vegetation or tree parts on which it was sighted, that is, the immediate habitat description where the bird

is seen such as tree, shrubs or on a building. Such vegetation was identified while height of trees/shrubs was estimated using Hager Altimeter. This was done for both mornings (08: 00hrs and 10:00hrs) and evenings (17:00hrs and 19:00hrs) for a period of three (3) weeks.

Each land use area was visited for a total of eight times (mornings and evenings for four days each). In all, there were 24 visits in all the land use types for a period of 3 weeks. Materials used during the survey includes GPS device, Digital camera, Field guide, Hager altimeter, Stopwatch, Meter rule and Recording sheet.

Data Analysis

The total number of individuals of the woodland kingfisher for each land use type was pooled together after the period of three (3) weeks. Descriptive statistics (percentages and bar charts) were used to summarize the frequencies or abundance and the distribution patterns of the Woodland kingfisher in each of the land use types. Data collected during this study were subjected to a one- way analysis of variance (ANOVA) to ascertain the land use type with a significant ($p<0.05$) high number of woodland kingfishers within the University of Ibadan.

Plate 1: A woodland kingfisher (*Halcyon senegalensis*) on a line, in residential land use type at the University of Ibadan

RESULTS

A total of 265 individuals of the woodland kingfisher (*Halcyon senegalensis*) were encountered during the period of the survey. One hundred and twenty individuals (45.3%) were observed in the residential area, 105 individuals (36.6%) were observed in the aquatic area while only 40 individuals were encountered in the forest area, which accounts for only

15.1% of the total encounters of the woodland kingfisher within the University of Ibadan (fig. 2).

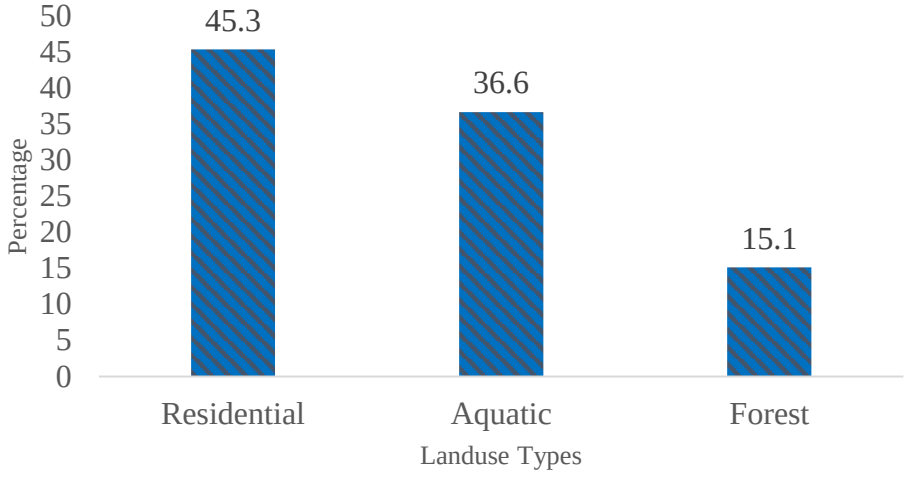

Figure 2: Abundance of Woodland kingfisher in different land use type

Tables 1-3 showed the marked GPS points for each land use type: the coordinates, habitat where they are seen and birds' activities. Activities engaged by Kingfisher across habitat were mostly the same which includes preening, calling and feeding. For the residential land use type, 7 of the marked 15 points were observed on shrubs, 5 on grasses, 2 on building top and one on tree. For the forest land use type, 9 out of the marked points of survey, kingfishers were found on trees, 3 on grasses and 3 on shrubs. Furthermore, in 6 different points of the aquatic land use type, kingfishers were observed on shrubs, 5 on trees and 4 on grasses.

According to Table 4, there was a significant ($p<0.05$) difference in the abundance of the woodland kingfisher in the different land use types within the University of Ibadan. Table 5 revealed that there was significant difference in the abundance of the woodland kingfisher in forest land area as compared to others. However, there was no significant difference in the abundance of the woodland kingfisher between residential and aquatic land use types. In all the sites, Kingfisher was observed to be mostly (≥33%) on grasses.

The mean frequency of the woodland kingfisher is highest in residential land use type over the 15 points sampled was 7.67 (≈8), followed by aquatic land use type with 7.00, but least in forest land use type, with mean frequency of 2.67 (Table 5). The frequency of encounter of the woodland kingfisher differed based on points at the various land use types. For aquatic land use type, the percentage was highest at point 5 (28%), followed by points 4, 6, 8 and 10 with 12% each. Points 7, 9, 13 had encounters of 5%, while other points had percentage encounter of less than 5%. For residential landuse type, the percentage encounter was highest at points 5 and 10 (20%), followed by points 6, 8 and 9 with 13% each. Points 4, 7, 13 had 7%, while other points had less than 7%. For the forest landuse type, point 2 the

highest count (47%), followed by point 3 with 40%. Point 4, had 10%, while other points had less than 10%. The number of Woodland Kingfisher was generally low (≤ 20%) but widely distributed in aquatic and residential landuse types while it is moderate (≤50%) and restricted within 3 points (GPS 2, 3 and 4) in the forest landuse type. Points with more bird count consisted of grasses and shrubs across all the landuse types (Figure 3). Woodland Kingfisher were mostly (46.70%) seen on grasses (*Imperata spp*) but sparsely (6.70%) on trees (*Terminalia catapa*, *Monodora spp*, and *Kola numida*) (Figure 3).

Table 1: GPS points, Kingfisher's activities and plants/habitat utilised in residential land use type, University of Ibadan

Points	Coordinates	Elevation (m)	Activities	Plant/ Habitat utilised
1	7° 26' 53"N 3° 53' 41" E	201	Preening, calling and feeding	Grasses
2	7° 26' 40"N 3° 53' 40" E	201	Preening, calling and feeding	Shrubs and building
3	7° 26' 37"N 3° 53' 49" E	206	Calling and feeding	Grasses
4	7° 26' 37"N 3° 53' 54" E	210	Preening, calling and feeding	Tree top
5	7° 26' 42"N 3° 53' 56" E	215	Preening, calling and feeding	Grasses and shrubs
6	7° 26' 42"N 3° 53' 59" E	218	Preening and feeding	Shrubs
7	7° 26' 45"N 3° 53' 2" E	221	Preening, calling and feeding	Grasses
8	7° 26' 49"N 3° 53' 5" E	229	Preening, calling and feeding	Shrubs
9	7° 26' 42"N 3° 53' 3" E	229	Preening and calling	Grasses
10	7° 26' 40"N 3° 53' 8" E	224	Preening, calling and feeding	Top of building
11	7° 26' 39"N 3° 53' 3" E	219	Preening, calling and feeding	Shrubs
12	7° 26' 38"N 3° 53' 9" E	220	Preening, calling and feeding	Shrubs
13	7° 26' 34"N 3° 53' 2" E	213	Preening, calling and feeding	Shrubs
14	7° 26' 32"N 3° 53' 8" E	212	Preening, calling and feeding	Shrubs
15	7° 26' 34"N 3° 53' 12" E	210	Preening, calling and feeding	Top of building

Table 2: GPS points, Kingfisher's activities and plants utilized in forest land use type, University of Ibadan

Points	Coordinates	Elevation (m)	Activities	Plant utilized
1	7° 27' 7"N 3° 53' 53" E	201	Preening, calling and feeding	Tree
2	7° 27' 7"N 3° 53' 48" E	207	Preening, calling and feeding	Tree
3	7° 27' 8"N 3° 53' 43" E	210	calling and feeding	Grasses
4	7° 27' 12"N 3° 53' 42" E	200	calling and feeding	Tree
5	7° 27' 16"N 3° 53' 40" E	193	calling and feeding	Grasses
6	7° 27' 20"N 3° 53' 31" E	195	Preening, calling and feeding	Shrubs
7	7° 27' 23"N 3° 53' 38" E	201	calling and feeding	Shrubs
8	7° 27' 24"N 3° 53' 40" E	198	Preening and feeding	Tree
9	7° 27' 26"N 3° 53' 43" E	200	Preening, calling and feeding	Tree
10	7° 27' 27"N 3° 53' 46" E	203	Preening, calling and feeding	Tree
11	7° 27' 28"N 3° 53' 48" E	200	Preening and feeding	Shrubs
12	7° 27' 29"N 3° 53' 50" E	202	Preening, calling and feeding	Grasses
13	7° 27' 30"N 3° 53' 52" E	199	Preening, calling and feeding	Tree
14	7° 27' 53"N 3° 53' 53" E	198	Preening, calling and feeding	Tree
15	7° 27' 53"N 3° 53' 51" E	185	Feeding	Tree

Table 3: GPS points, Kingfisher's activities and plants utilised in aquatic land use type, University of Ibadan

Points	Coordinates	Elevation	Activities	Plant utilised
1	7° 26' 26"N 3° 53' 11" E	208	Feeding	Tree
2	7° 26' 34"N 3° 53' 13" E	207	Preening, calling and feeding	Tree
3	7° 26' 20"N 3° 53' 8" E	207	Preening, calling and feeding	Grasses
4	7° 26' 14"N 3° 53' 13" E	200	Preening and calling	Tree
5	7° 26' 24"N 3° 53' 16" E	203	Preening and calling	Grasses and shrubs
6	7° 26' 38"N 3° 53' 18" E	205	Preening and calling	Shrubs
7	7° 26' 35"N 3° 53' 14" E	201	Preening and calling	Grasses
8	7° 26' 40"N 3° 53' 22" E	207	Preening and calling	Tree
9	7° 26' 41"N 3° 53' 15" E	205	Preening and calling	Grasses
10	7° 26' 34"N 3° 53' 13" E	203	Preening and calling	Shrubs
11	7° 26' 14"N 3° 53' 9" E	200	Preening and calling	Shrubs
12	7° 26' 13"N 3° 53' 17" E	202	Preening and calling	Tree
13	7° 26' 43"N 3° 53' 35" E	207	Preening, calling and feeding	Shrubs
14	7° 26' 36"N 3° 53' 30" E	205	Preening, calling and feeding	Shrubs
15	7° 26' 42"N 3° 53' 32" E	202	Preening, calling and feeding	Shrubs

Table 4: Abundance of woodland Kingfisher across land use types in University of Ibadan

Source of Variation	D.f.	S.S.	M.S.	V.R.	F pr.
Rep stratum	14	88.444	6.317	1.70	
Rep.*Units* Stratum					
Treat	2	221.111	110.556	29.70	<.001
Residual	28	104.222	3.722		
Total	44	413.778			

Table 5: Population estimate of woodland Kingfisher across land use types in University of Ibadan

Land use type	Population means
Aquatic	[a]7.00
Residential	[a]7.67
Forest	[b]2.67
LSD	1.443

*Values with same letters are not significant

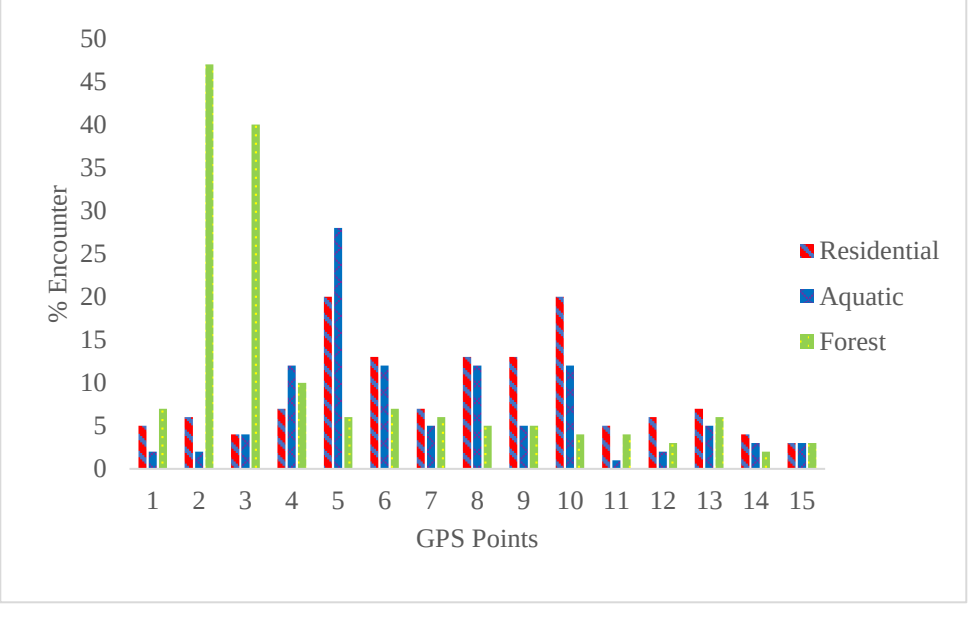

Figure 3: Percentage frequency (encounter) of Woodland Kingfisher across land use types in University of Ibadan

Table 6 presented the frequency of plant species on which Woodland Kingfisher was encountered in University of Ibadan. Grasses were the dominant and commonest vegetation across all the landuse types, 46.70%, 40.00% and 33.30% in aquatic, forest and residential sites respectively. This was followed by *Delonix regia* 20.30% in residential and 13.30% in both aquatic and forest landuse type. Residential site recorded six plant species followed by five species in forest and the least (4) in aquatic landuse type.

The mean height of trees on which Woodland Kingfisher was encountered was presented in Figure 4. Forest had the highest mean (42m) followed by Residential (35m) and the least was found in aquatic (30m).

Table 6: Frequency of plant species on which woodland Kingfisher was encountered in UI

Tree species	Aquatic n (%)	Residential n (%)	Forest n (%)
Delonix regia	1 (13.30)	3 (20.30)	2 (13.30)
Grasses	7 (46.70)	5 (33.30)	6 (40.00)
Ficus spp	2 (13.30)	3 (20.00)	0
Palm tree	4 (26.70)	0	0
Albezia lebbek	0	2 (13.30)	0
Terminalia catapa	0	1 (6.70)	3 (20.00)
Monodora spp	0	1 (6.70)	0
Kola numida	0	0	1 (6.70)
Acacia spp	0	0	3 (20.00)

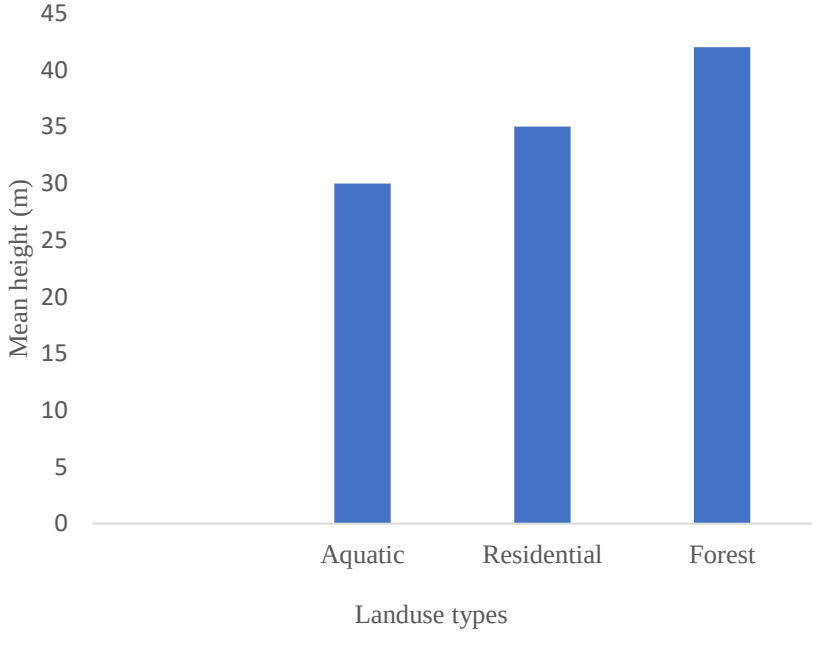

Figure 4: Mean heights of trees (m) across land use types upon which woodland Kingfisher was encountered

DISCUSSION

The woodland kingfisher had the highest abundance in the residential area of the study compared to the forest and aquatic areas. The woodland kingfisher maybe more flexible towards habitat change and has the ability to adapt better in an open area with passive disturbance, that is, an area with some trees, minor vehicular movement, minimum to medium human population and no direct threat like hunting and nest destruction. The number and encounter rate increased towards the aquatic area. This is because the aquatic area has some form of residence which may have prompted the high figure. Although the species has been reported to be present around drier areas far from water (Hocney, 2017). The forest area had the least abundance; perhaps, it does not have the required food source needed by the bird or probably because of the canopy cover of the forest area. The forest area is characterized by tall trees with closed canopy and in a way, it would slow the rate at which grasses grow at the ground level thus, it may limit the quantity of food like insect's present. All these factors might have limited the activities of kingfisher or cause their migration to a more suitable location like the residential land use type. This outcome could also be attributed to the fact that the woodland kingfisher prefers an open land area as opposed to thick forest areas, possibly because their diets (insects) are highly visible in grasslands and other open areas compared to forest areas where visibility is very low (Coates *et al.*, 2007). There was significant difference in the abundance of the woodland kingfisher between forest land use type and other land use types, but there was no significant difference in the abundance of the woodland kingfisher between residential and aquatic land use types. This could be due to the fact that the aquatic and residential landuse types are open spaces (Savanna lands) whereas the forests area are dominated by tall canopy trees, reducing visibility of the kingfishers in terms of detecting and picking up preys (insects). The percentage encounter of the woodland kingfisher differed based on points at the various landuse types. For aquatic landuse type, the percentage encounter was highest at some points while others had low percentage encounter. The points with the highest encounters consisted of grasses and shrubs and this may be due to the fact that the woodland kingfisher is primarily an insectivore that prefers open spaces where it can easily pick up its preys. This is similar for forest landuse type, where the percentage encounter was highest at some point and least for others. The points with the highest encounters consisted of grasses and shrubs, probably because woodland kingfisher is primarily an insectivore that prefers open spaces where it can easily pick up its preys. The overall preferred landuse type based on the species abundance for woodland kingfisher is the residential landuse type. The finding of this study is in consonance with Coates *et al.* (2007) who maintained that the kingfisher prefers open land areas with few canopy cover and prefers grasslands where it can easily locate its preys

CONCLUSION

A total of 265 individuals of the woodland kingfisher (*Halcyon senegalensis*) were encountered during the periods of the survey and out of these encounters, the highest abundance was at the residential landuse type, which was followed closely by the aquatic landuse type. The forest land use type had the least species abundance. These three habitats have different levels of disturbance, open spaces and vegetation cover. The residential landuse type that had more woodland kingfisher, was characterized with some level of human disturbance, open spaces and fewer trees compared to the other landuse types (aquatic area

and forest landuse type). This therefore implies that the woodland kingfisher is more flexible and adapts well in a somewhat urban setting or a changing environment.

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