



WET SEASON ABUNDANCE AND DISTRIBUTION OF RIPARIAN BIRDS IN MOROGORO MUNICIPAL, TANZANIA

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ABSTRACT

The taxonomic composition, species richness, abundance and distribution of riparian avifauna in Morogoro Municipal were assessed between March and May 2001 at random points along Kikundi, Morogoro and Ngerengere rivers. The point count method with unlimited radius was employed, and the same points were used throughout the study period. Of the fifty-eight bird species identified twenty-seven (47 %) were recorded along Kikundi River; twenty-eight (48 %) along Morogoro River and forty (69 %) along Ngerengere River. Species richness did not vary significantly ($\chi^2 = 3.303$; $p > 0.05$) among the rivers, but abundance differences were significant ($\chi^2 = 46.105$; $p < 0.05$). It was recommended that patches of natural vegetation in farm areas along rivers and away be left for bird conservation purposes because they tended to support more bird species than sheer stands of crops.

INTRODUCTION

Diversity (special richness and abundance) and distribution of bird population is influenced by habitat stability, within which all birds have a preferred specialised niche (Dorst 1974, Newmans 1988). The degradation or destruction of these habitats could result into failure for some bird species to adapt to transformed habitats (Dorst 1974, Newmans 1988 & Buehler *et al.* 1991), or displaced by species better adapted to a new habitat, and occasionally may become locally extinct (Dorst 1974, Crawford *et al.* 1991). Pied Crow (*Colvus*

albus), for example, easily adapt to urban environment since its feeding and nesting behaviour is favoured. On the other had, birds such as Tropical Boubou (*Laniarus aethiopicus*) may disappear with destruction of forests. Effects of degradation are more remarkable for bird species in riparian habitats as this is a very restricted habitat type.

Pollution caused by industrial effluents, agricultural inputs such as pesticides, herbicides and chemical fertilizers, and domestic wastes have impact on riparian birds. Unfortunately, high demand for land in towns and cities makes conservation of less importance (Wium-Andersen and Reid, 2000), consequently such problems being rampant (Pomeroy 1992).

Bibby *et al.* (1998) emphasised on the importance of assessing either the conservation importance of areas or relative values of different habitats or areas through determining the diversity of species. In recognition of this, several ornithological studies (in 1926 & 1965) were carried out in Morogoro municipal. These earlier studies were focused on Uluguru Mountains around Nyingwa probably south of present Lanzi, as well as Uluguru south and north Forest reserves, Kimboza, Tchenzema, Morning side and Bunduki I and III Forest Reserves (Svendsen *et al.* 1995). Further studies conducted in 1993 were done at various altitudes such as Lanzi (1550 - 2500m above sea level), Kimhandu (1480 -



2634m above sea level), Tegetero (1130 - 1950m above sea level) and Kigurunyembe area above the Teacher's Training College (600 - 850m above sea level).

Despite these efforts, riparian bird community in the Morogoro Municipal had remained unknown. This study therefore aimed at furthering knowledge on birds in the study area by including representative samples of riparian habitat to enhance understanding of taxonomic composition, species richness, abundance and distribution of bird fauna along the three rivers, and to prepare a checklist of riparian birds of Morogoro Municipal. We are optimistic that such information may contribute to provision of protection and conservation measures by the charged authority, whereas the checklist will serve as baseline information for monitoring the avifaunal properties of the study area.

MATERIALS AND METHODS

Description of study area

Morogoro Municipality is situated about 200 km east of Dar-es-Salaam, on the northern foot of Uluguru Mountains, from which Mgeta, Ngerengere and Morogoro rivers arise (Lundgren 1978). These rivers eventually join the Ruvu River, the major source of water for Dar es Salaam. The altitude ranges between 500 m and 600 m above sea level.

The average annual rainfall is 890mm but this amount may increase slightly with altitude. The dry season is between June and October and temperatures range between 24°C (in December) and 20°C (in July) (Svendsen *et al.* 1995).

Apparently, farms now surround the Municipal, which formerly was in the Miombo woodland. Almost all areas have been turned into farms up to the river edges (0.5 - 5m). In the township buildings reach

the edges of the rivers (0.5 - 1m). Only few patches of natural vegetation remain on the lower slopes of Uluguru Mountains and along rivers (riparian vegetation). The remaining vegetation is mainly secondary savannah.

Most of riparian vegetation has been disturbed especially in lower areas (≤ 500 m above sea level) where paddy and sugarcane are grown extensively. Common naturally occurring tree species in the riparian community include *Ficus spp*, *Albizia spp*, *Kigelia africana*, *Melicia excelsa*, *Arundinaria spp*, *Vernonia spp*, *Bridelia spp* and *Sterculia spp*. Others like *Eucalyptus spp* and *Grevillea robusta* form common stands of non-fruit trees planted for various purposes including halting erosion and provision of shelter in areas where settlements are close to a riverbank.

Fruit trees grown are *Mangifera spp*, *Anona spp*, *Syzygium spp*, citrus, coconut (*Cocos nucifera*), avocado and guava (*Psidium guajava*). Other crops include cassava (*Manihot esculenta*), banana (*Mussa spp.*), cowpea, beans (*Phaseolus vulgaris*) and groundnuts. These are usually inter-cropped with maize (*Zea mays*). Horticultural crops are onions, cabbage, tomatoes, carrots and *Amaranthus spp.* during the dry season, water from the rivers is used to irrigate these crops.

The sides of Ngerengere river are dominated by *Phragmites mauritius*. The vegetation is encountered almost all along the 4.30 km sampled. Likewise, some swampy areas have *P. mauritius*, *Cyperus spp* and other grass species. As you go upstream along Morogoro and Kikundi rivers, natural vegetation is mainly confined to the riverbanks, and in some areas only to the waterline. Brick making and stone crushing for building purposes are important activities along the Morogoro River. Within the township, litter, especially non-biodegradable material,



sewage and other refuse are the chief source of water contamination.

Data collection and analysis

This study was done in riparian habitats along Morogoro (15 sampling points), Kikundi (18 sampling points) and Ngerengere Rivers (17 sampling points). Kikundi River enters the Morogoro River almost at the centre of the town, and the Morogoro River joins the Ngerengere River, the branch of the Ruvu River a few kilometers downstream.

Each river was considered a line transect, consequently collection of data involved walking along them. Both initial and subsequent sampling points along each river were located randomly. The point count method with unlimited radius as described by Pomeroy (1992) and Gibbons *et al.* (1998) was employed, and the same points were used throughout the study period. At each sampling point, birds were identified, counted and recorded. The total distance sampled along the three rivers was 14.46 km (Morogoro 5.39, km; Kikundi, 4.77 km and Ngerengere, 4.30 km). A total of 50 sampling points were established and at each, a considerable time was spent counting birds. Sometime up to 3 minutes would be spent before counting started to allow birds to settle down (Gibbons *et al.* 1998). All surveys were done between 6.00 a.m. and 6 p.m. and all points along the three study rivers were covered at all hours of the day on different days. Birds were identified by visual observation and vocalization. The nomenclature (Common and scientific names) adopted in this paper followed Wium-Andersen and Reid (2000) except for a few species, which were picked either from Williams & Arlott (1996) or Zimmerman *et al.* (1999). *Chi*-square test was used to test for significant difference in

species richness and abundance between the rivers.

RESULTS AND DISCUSSION

Out of fifty sampling points, 58 species and 528 individuals of birds were identified and counted respectively. The proportion of each species counted was calculated in percentage as shown in Table 1. Of the 58 bird species identified, 27 species comprising of 17 families and 7 orders were recorded along Kikundi river; 28 species of 17 families and 7 orders along the Morogoro river; and 40 species of 21 families and 8 orders along Ngerengere river (Appendix I).

Of the six species whose abundance exceeded 5%, Pied Crow (*Corvus albus*) was the most abundant (21.2%). The species was seen at fifteen sampling points. Contrary, Zanzibar Red Bishop (*Eupletes nigroventris*) which ranked second (9.28%), was sighted at slightly more sampling points (16). Similarly, Common Bulbul (*Pycnonotus barabatus*) and African Open-billed Stork (*Anastomus lamelligerus*) occurred at about the same number of sampling points as *Corvus albus* and *Eupletes nigroventris* (Table 1). However, the two species were less abundant (3.03% and 3.79% respectively). Interestingly, Cattle Egret (*Bubulcus ibis*), which was recorded at only four sampling points, was more abundant (7.39%) than *Pycnonotus barabatus* and *Anastomus lamelligerus*. *Pycnonotus barabatus* is a common and widely distributed species found in gardens, in old farms, woodland, coastal scrub, open forest and secondary growth such as lantana thickets. This distribution differs greatly from that of *Anastomus lamelligerus*, which is limited to swamps and marshes, flooded areas and slow flowing rivers.



Table 1: Diversity and abundance of species as observed during the wet season survey in Morogoro municipality

Serial number	Common name	Scientific name	Number of individuals	Sampling points	Relat. Abundance (%)
1	Common Bulbul	<i>Pycnonotus barbatus</i>	16	13	3.03
2	African Citril	<i>Serinus citrinelloides</i>	5	5	0.95
3	Tropical Boubou	<i>Laniarus ferrugineus</i>	3	2	0.57
4	Grey-headed Sparrow	<i>Passer griseus</i>	8	5	1.52
5	House Sparrow	<i>Passer domesticus</i>	16	6	3.03
6	Speckled Mousebird	<i>Colius striatus</i>	15	8	2.84
7	Pied Crow	<i>Corvus albus</i>	112	15	21.21
8	Bronze Mannikin	<i>Lonchura cucullata</i>	28	7	5.30
9	Red-checked Cordon-bleu	<i>Uraeginthus bengalus</i>	3	3	0.57
10	House Crow	<i>Corvus splendens</i>	15	6	2.84
11	Northern Brown -throated Weaver	<i>Ploceus castanops</i>	40	9	7.58
12	Common Waxbill	<i>Estrilda astrild</i>	3	1	0.57
13	Brown-hooded Kingfisher	<i>Halcyon albiventris</i>	2	2	0.38
14	Little Egret	<i>Egretta garzetta</i>	1	1	0.19
15	African Firefinch	<i>Lagonosticta rubricata</i>	1	5	2.46
16	Variable Sunbird	<i>Nectarinia superba</i>	3	3	0.57
17	Black- winged Red Bishop	<i>Euplectes hordeacea</i>	30	11	5.68
18	Zanzibar Red Bishop	<i>Euplectes nigroventris</i>	49	16	9.28
19	Grey Heron	<i>Ardea cinerea</i>	3	3	0.57
20	Black Kite	<i>Milvus migrans</i>	2	2	0.38
21	African Open - billed Stork	<i>Anastomus lamelligerus</i>	20	15	3.79
22	Blue-spotted Wood Dove	<i>Turtur rafer</i>	3	2	0.57
23	White -browed Coucal	<i>Centropus superciliosus</i>	5	5	0.95
24	Long- crested Eagle	<i>Lophaetus occipitalis</i>	1	1	0.19
25	Cattle Egret	<i>Bubulcus ibis</i>	39	4	7.39
26	White – naked Raven	<i>Corvus albicollis</i>	14	3	2.65
27	Augur Buzzard	<i>Buteo augur</i>	1	1	0.19
28	White-backed Night-Heron	<i>Gorsachius leuconatus</i>	1	1	0.19
29	Purple Heron	<i>Ardea purpurea</i>	2	2	0.38
30	Hamerkop	<i>Scopus umbretta</i>	5	5	0.95
31	Giant Kingfisher	<i>Megaceryle maxima</i>	1	1	0.19
32	Ashy Flycatcher	<i>Muscicapa caerulescens</i>	2	1	0.38
33	Red- winged Starling	<i>Onychognathus morio</i>	11	1	2.08
34	Brown - crowned Tchagra	<i>Tchagra australis</i>	1	1	0.19
35	White - browed Robin Chat	<i>Cossypha heuglini</i>	3	2	0.57
36	African Pied Wagtail	<i>Motacilla aguimp</i>	3	3	0.57
37	Cardinal Woodpecker	<i>Dendropicos fuscescens</i>	1	1	0.19
38	Village Indigobird	<i>Vidua chalybeata</i>	1	1	0.19
39	Green Bulbul	<i>Phyllastrephus spp</i>	1	1	0.19
40	Common Wattle- eye (Brown-throated Wattle-eye)	<i>Platysteira cyanea nyansae</i>	2	1	0.38
41	Emerald - spotted Wood Dove	<i>Turtur chalcospilos</i>	1	1	0.19
42	Abdim's Stork	<i>Ciconia abdimii</i>	2	1	0.38
43	Red - billed Firefinch	<i>Lagonosticta senegala</i>	2	1	0.38
44	African Pygmy Kingfisher	<i>Ispidina picta</i>	1	1	0.19
45	Striped Kingfisher	<i>Halcyon chelicuti</i>	1	1	0.19
46	Black - headed Weaver	<i>Ploceus cucullatus</i>	14	2	2.65
47	Grosbeak Weaver	<i>Amblyospiza albifrons</i>	3	2	0.57
48	Allen's Gallinule	<i>Porphyrio alleni</i>	2	1	0.38
49	Malachite Kingfisher	<i>Alcedo cristata</i>	4	3	0.76
50	Didric Cuckoo	<i>Chrysococcyx caprius</i>	2	1	0.38
51	Martial Eagle	<i>Polemaetus bellicosus</i>	1	1	0.19
52	Lilac - breasted Roller	<i>Coracias caudata</i>	2	2	0.38
53	Pin - tailed Whydah	<i>Vidua macroura</i>	1	1	0.19
54	African Paradise Flycatcher	<i>Terpsiphone viridis</i>	1	1	0.19
55	Pied Kingfisher	<i>Ceryle rudis</i>	2	2	0.38
56	Black - backed Puffback	<i>Dryoscopus cubla</i>	1	1	0.19
57	Spotted Ground Thrush	<i>Zoothera guttata fischeri</i>	1	1	0.19
58	Yellow-collared Lovebird	<i>Agapornis personatus</i>	3	1	0.57

n = 528

The bird may occur in large flocks and its distribution in the named habitats is governed by the presence of certain large water snails and bivalve molluscs, which

form its main diet. The clustery distribution of water snails and bivalve molluscs on the one hand, and the random distribution of fruits on the other, explain



the wide dispersal of *Anastomus lamelligerus* and *Pycnonotus barabatus* respectively observed during this study. *Pycnonotus barabatus* feeds on a broad spectrum of fruits in a range of habitats (Williams & Arlott 1996).

High abundance of *Bubulcus ibis* is ascribed to its gregarious behaviour on stretches of grassland, and swamps and marshes in the riverine where they may feed on frogs, insects and other invertebrates (Williams & Arlott 1996). Likewise, Brown throated Weaver (*Ploceus castanops*) was mostly found in nesting colonies either in *Acacia* trees or *Phragmites mauritius* on riverbanks, often in open areas along the Morogoro and Ngerengere rivers. Being in colonies they are easily detected. Moreover, Bronze Mannikin (*Lonchura cucullata scutata*), which was recorded at only seven points, has comparatively high proportion (5.3%) because the bird feeds in flocks in open area (grassland). The flocking tendency facilitated their detection.

High abundance of *Corvus albus* was attributable to the conspicuousness of the species as they are large in size and gregarious. Groups ranging in size between 20 and 34 birds were recorded on Kikundi and Morogoro rivers. These rivers pass through areas with high human population density, consequently high garbage generation, which is deposited in the riverine. Presence of garbage, a dependable source of food for the species, justifies association with garbage deposit sites along the rivers. However, the number declined as one moved upstream. Such big groups of *Corvus albus* along the rivers are also common at Sokoine University of Agriculture main campus, where they scavenge on food items ranging from leftovers to insects.

Like other Corvids (*Corvus splendens* and *Corvus albicollis*), *Corvus albus* has the history of living in close proximity to

human habitation (Wium-Andersen & Reid, 2000; Williams & Arlott, 1996.), thereby exploiting food sources associated with human activities, for example, cereal crops, animal husbandry and refuse). This explains why big flocks of *Corvus albus* such as those observed on Morogoro and Kikundi Rivers were not observed along Ngerengere River, which is sparsely settled but farmed extensively. On the whole, *Corvus albus* appeared to be widely distributed due to their ability to adapt well to human settlement if garbage is available, as well as to other habitats.

Observations by Pomeroy (1992) that population of Marabou Stork (*Leptoptilos crumeniferus*), another bird that depend upon man for significant proportion of food, was growing more slowly in rural areas than in urban areas of Uganda fits well with results of this study. Engel and Young (1992) also accounted the availability of extra food (refuse) to be the factor responsible for influencing the distribution and abundance of Common Raven (*Corvus corax*), another member of Corvidae family, in Idaho USA.

A large flock (about 30) of resting *Corvus albus* was encountered along Morogoro River in a habitat sandwiched between maize and banana farms, adjacent to natural vegetation. Such vegetation mosaic is said to bring about "edge effect" which in turn favours occurrence of larger variety of birds (Welty & Baptista 1988). With the exception of this, the general patterns were the same as for the Kikundi River. In addition, *Corvus albus* was seen sometimes in association with *Corvus splendens*, which was introduced to East African coast in the last century. However, its population has now expanded its range towards inlands and has already established itself in Morogoro since 1997 (Wium-Andersen & Reid 2000).

This study found that the population of *Corvus splendens* accounted for 2.84% of



the sampled population. From this observation it is most probable that its population is growing relatively faster than its native *Corvus albicollis*, which accounted for only 2.65%. If this trend continues, *Corvus splendens* may replace *Corvus albus* and become nuisance or pest bird. Since this species has tendency of feeding on indigenous birds and poultry, there are chances that it may exterminate some native birds. For instance, *Corvus splendens* is held responsible for the disappearance of some species including the African Paradise Flycatcher (*Terpsiphone viridis*) in Dar es Salaam due to their predatory behaviour (Wium-Andersen & Reid 2000). All encounters of *Corvus splendens* recorded during the survey were within township and parts of Ngerengere river that border Solomom Mahlangu Campus of the Sokoine University of Agriculture.

Two species of sparrow, House Sparrow (*Passer domesticus*) and Grey-headed Sparrow (*Passer griseus*), the former also being an introduced species to East Africa (Wium-Andersen & Reid 2000), were observed associating with human settlement in the municipal.

Passer domesticus was recorded at six points most of which were in township especially in the vicinity of maize mills since it is graminivorous, whereas *Passer griseus* besides being recorded at fewer sampling points (15), was also recorded away from the township area. *Passer domesticus* tends most to nest in thatched buildings. Holden and Sharrock (1992) explained that *Passer domesticus* lives in towns, cities, gardens, parks, farmlands and other places, which are not distant from human settlements. They attached its wide occurrence to its ability to use wide food variety and improved feeding habits.

More bird individuals of *Euplectes nigroventris* were observed along Morogoro and Ngerengere rivers where

Phragmites mauritius is currently the dominant vegetation. Associated with this bird was the Black-winged Red bishop (*Euplectes hordeaceus*), which was recorded at eleven points. Both species were commonly observed nesting in farmlands along the rivers. Grain foods especially rice, and nesting cover provided by *Phragmites mauritius* probably influenced their distribution.

Birds were hardly seen or heard at the upper parts of Kikundi River (>544m above sea level). A few seen were *Passer domesticus*, *Passer griseus* and *Corvus albus*. Birds in this area are collectively secretive, undergrowth skulking and forest birds. Besides, the upper part of the stream is narrower, deeper and with low habitat diversity compared to the lower part. Swamps, which only occurred in the lower part and entirely, absent on the upper part represents a good example of a restricted habitat type at disposal of birds. We thought that deep and fast moving water of this river posed constraints to both waders and fish-eating birds particularly kingfisher therefore hard to wade and catch fish respectively. We directly linked these factors to both low species richness and abundance observed in the upper parts of Kikundi River. Nevertheless, congregations and deafening vocalizations of breeding Zanzibar Red Bishop (*Euplectes nigroventris*) and variety of other weavers in the lower parts of the river enhanced their detection, a factor which contributed to the observed species richness and population abundance. Usually some of these birds during non-breeding season hardly make calls (Burgess & Mlingwa 2000) therefore relatively difficult to notice.

The sampled segment of Ngerengere River was nearly a flatland. This land feature made the area marshier than is the case for the other two rivers. As for the Morogoro River, there were more bird species and individuals in portions of the riparian habitat that exhibited heterogeneity in



vegetation. These were areas with vegetation mosaic such as comprising of grassland, farmland, woodland and *Phragmites mauritius*. Unlike for Kikundi and Morogoro rivers, here water speed is low and the stream is wider. This environment supports waders and birds that feed on fish and other marshy animals such as frogs and crabs. As a result, bird species that were not recorded along Kikundi and Morogoro rivers, for instance, Allen's Galinule (*Porphyrio alleni*), Abdim's Stork (*Ciconia abdimii*), Grey Heron (*Ardea cinerea*), Purple Heron (*Ardea p. purpurea*) and Martial Eagle (*Polemaetus bellicosus*) were encountered. Six species of Kingfishers were recorded (Appendix I), of which five were recorded along Ngerengere River and only one, Brown-hooded Kingfisher (*Halcyon albiventris*) sighted along both Morogoro and Ngerengere rivers. These birds and Open-billed Stork (*Anastomus lamelligerus*) are representatives of birds that cherish marshy or swampy habitat. There were more Kingfisher species recorded along Ngerengere river due to slow- water speed (Becker 1998) and presence of *Phragmites mauritius*, which provide perching and vantage points above water. This species richness is credited to habitat diversity and terrain of the land, which contributed to favourable water characteristics.

In his study of bird communities along the Omo River in Ethiopia, Becker (1998)

observed that species richness increased with decreasing altitude and was highest in areas associated with flood plains. He attributed this phenomenon to rich flora, which is the result of organic substance, and slow- moving water that probably enhanced prey abundance, which in turn made this portion of the river attractive to waders. He also observed that Kingfisher and Heron species increased down the stream. Results of this study agree with Becker's observation.

There was no enough evidence to suggest differences in patterns of species richness ($\chi^2 = 3.303$; $p > 0.05$) among the rivers. The opposite was the case for patterns of abundance ($\chi^2 = 46.105$; $p < 0.05$), whereby the differences were significant. However, the overall abundance values for Kikundi and Morogoro Rivers were relatively low.

At this time of year, farms (especially maize farms) were scattered almost all along the sampled area. This accounted for habitat homogeneity, which might have influenced the distribution of bird species. Fruiting trees including *Ficus spp* and flocks of breeding weavers were encountered at all study rivers. The fruiting trees might have influenced the distribution of fruit eaters such as *Pycnonotus barbatus* and *Colius striatus*. These two factors explain the insignificant difference in species richness.

Table 2: Distribution of bird species richness for the three rivers in Morogoro Municipality

Class interval	Rivers			
	Kikundi	Ngerengere	Morogoro	Total
1 – 4 species	13* (28.3%)	8 (7.4%)	11 (23.9%)	32 (69.6%)
5 – 9 species	3 (6.6%)	6 (13.0%)	1 (2.2%)	10 (21.7%)
> 9 species	-	3 (6.5%)	1 (2.2%)	4 (8.7%)
TOTAL	16 (34.8%)	17 (36.9%)	13 (28.3%)	46 (100%)

*Frequency observations with percentage in parentheses



Table 3: Distribution of bird population for the three rivers

Class interval	Rivers			
	Kikundi	Ngerengere	Morongoro	Total
1 – 10 birds	11* (23.9%)	10 (21.7%)	8 (17.2%)	29 (63.0%)
11 – 20 birds	3 (6.5%)	2 (4.3%)	3 (6.5%)	8 (17.4%)
20 > birds	16 (34.8%)	17 (36.9%)	13 (28.3%)	46 (100%)

*Frequency observations with percentage in parentheses

Table 4: General distribution of species richness and abundance among the three rivers

Name of the river	Number of bird species	Number of individuals of birds counted
Kikundi	27	127
Ngerengere	40	255
Morongoro	28	170

CONCLUSION AND RECOMMENDATIONS

The study was conducted during wet season when resources such as food, water and shelter were not limiting to birds. Different results may be experienced during dry season, because at that time, resources such as fruits are limited. A dry season survey is therefore required to have a year round picture of the parameters studied. This is important, as it is one way to acquire good understanding on distribution of diversity and species composition of bird fauna in the area. The use of mist net in the future will bring forward information that could not be unveiled during this survey. This is critically important because birds encountered in some areas are creepers and skulking individuals, especially on the upper parts of the rivers where vegetation have thick undergrowth and visibility is hindered.

Studies in different parts of the world have shown that patches of natural vegetation in farm areas tend to support more bird species than pure stands of crops since a mixture of these creates “edge effect”. Therefore, for bird conservation purposes, patches of natural vegetation should be left along rivers particularly on the lower parts (< 544m above sea level for this study) to maintain the habitat for bird species that depend on riparian habitats such as

Hamerkop (*Scopus umbretta*) and increase bird diversity.

The Municipal has two bird species that were introduced to East Africa namely House Sparrow and House Crow. Depletion of indigenous birds by House Crow in Dar es Salaam is a problem that may be extended to Morogoro. One wonders whether the native bird populations will stand the growing population of this predator species? Secondly, the House Crow shares food sources rejected by human with native Pied Crow. If the House Crow population increases, there is a possibility of experiencing severe competition between the two Corvids, the result of which so far is unknown and difficult to predict the fate. It is worth noting that House Crow population and their predatory behaviour on other birds needs to be monitored closely so that the nuisance of the species already understood do not befall Morogoro.

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