

A bird survey of the Budalang'i Flood Plain, Busia County, Kenya

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Summary

A seven-day survey of birds was carried out in the Budalang'i Flood Plain area in May 2019. Twenty line transects totalling 24.83 km in length were covered using the distance sampling technique. A total of 6149 individuals of 151 bird species were recorded. Species associated with farmlands (*Ploceus pelzelni* and *Columba guinea*) and wetlands (*Anastomus lamelligerus*) were the most frequently encountered and numerous. The Oluhongo Swamp, which is part of the northern extension of Yala Swamp Important Bird Area, had the highest species richness and diversity. Papyrus endemics and threatened swamp-dependent species such as *Laniarius mufumbiri*, *Cisticola carruthersi*, *Crithagra koliensis*, *Muscicapa aquatica*, *Acrocephalus gracilirostris* and *Bradypterus carpalis* were recorded. Two individuals of the Endangered *Balearica regulorum* were recorded as well. No Palaearctic migrant species were recorded as it was outside the migration period. Habitat loss and pressure resulting from drainage of swamps to reclaim land, strengthening of dykes to reduce the impact of the floods, pollution and extension of agricultural activities continue to threaten the future existence of these endemic and endangered species.

Keywords: species, richness, abundance, diversity, wetlands

Introduction

Birds play many roles in an ecosystem including as predators, pollinators, scavengers, seed dispersers, seed-eaters, and ecosystem engineers (Whelan *et al.* 2008). These roles in many ways impact human health, economy, and food production, both directly and indirectly (Şekercioğlu *et al.* 2016). The Budalang'i Flood Plain is renowned for frequent flooding that leads to displacement of residents, and destruction and loss of property (Makhanu *et al.* 2007). The escalation of humanitarian concerns is blamed on increased frequency, force and severity of floods and droughts. The increased impact of the floods and droughts is attributed to climatic change exacerbated by the rapid ecological transformation of the area. This ecological transformation could be basically described as changes in land use driven by increased settlements and infrastructure developments. The consequence of this transformation is the declining state of natural habitats as well as the presence and abundance of wildlife species, including birds. Baseline information on birds in this flood plain has not been documented. The northwestern corner of the Yala Swamp Important Bird Area (IBA) overlaps with this area (Bennun & Njoroge 1999). Birdlife International (2020) in their recent review indicated that the Yala Swamp is an IBA in danger. Hence the aim of this study was to provide baseline information on bird species occurrence, richness, abundance, distribution, and diversity in this area that is adjacent to the Yala Swamp.

Bird taxonomy and nomenclature follow the fourth edition of the *Checklist of the Birds of Kenya* (EANHS 2009) and English names are given in the Appendix.

Study area

The Budalang'i Flood Plain area extends between longitudes 33°56'30" to 34°10'30" E and latitudes 0°0'30" S to 0°11'30" N and covers part of Siaya County and Busia County (Onywere *et al.* 2007). This area is the lowest part of the Nzoia River catchment and basin. It stretches for about 20 km from Rwambwa Bridge westwards to the river mouth at Bukoma Beach on the shore of Lake Victoria (Fig. 1). The River Nzoia meanders through this relatively flat area of the flood plain that slopes from an altitude *c.* 1148 m to *c.* 1135 m. The river, with its meandering in the flood plain area is estimated to be 40 km in length. This area is characterized by riparian herbaceous vegetation and open grasslands fragmented by a mosaic of small-scale farms as well as patchy papyrus-dominated swamps. The northwestern corner of the Yala Swamp IBA is part of this study area (Bennun & Njoroge 1999). The main activities of the local people in the Budalang'i Flood Plain are small-scale farming, livestock grazing, fishing and riverbed sand harvesting at a subsistence level.

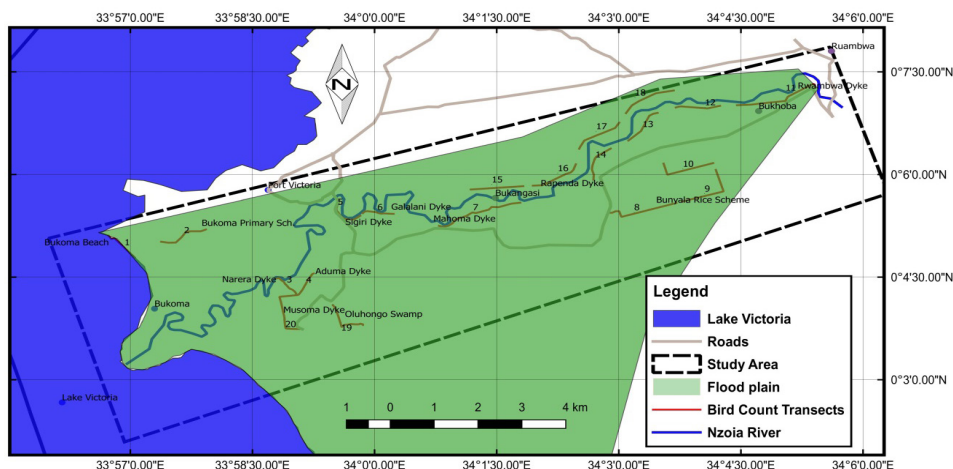


Figure 1. Map of the Budalang'i Flood Plain study area showing bird survey transects (May 2019).

The area receives bimodal rainfall with long rains experienced in April–May and short rains in the October–November period. The average annual rainfall is relatively low, estimated at about 800 mm. These rains are also known to fail occasionally, leading to periodic droughts. The Nzoia River provides water for irrigation in Budalang'i all year round. Several instances of severe floods have been recorded in the past. The floods result from water supplied by Nzoia River and its tributaries from the high rainfall areas upstream (Wepukhulu & Rees 2015). The floods deposit sediment that contributes to the area's good agricultural production. There are dykes on either side of the river that measure a total length of 34.6 km. Of these, 16.2 km in length of the dykes are on the northern banks and 18.4 km on the southern banks (Otiende 2009). These dykes were built to reduce the impact of the floods.

Methods

A survey was carried out in the Budalang'i Flood Plain from 22–29 May 2019. This survey sampled the flood plain from Rwambwa Bridge to the river mouth at Bukoma Beach on Lake Victoria. The transects covered Bukoma Beach, swamp edges, streams and river-banks in the flood plain, roads in the Bunyala Rice Irrigation Scheme, and the dykes. Generally, all transects cut across areas of mosaic habitat that were fairly open, including the papyrus swamp edge areas. Distance sampling technique was employed using two observers. Each transect was covered within a time period of one hour. The observers were equipped with pairs of binoculars (with magnification of 10x 42). One of the observers was dedicated to recording the data, but also assisted in the identification and counting of birds seen.

All the bird species seen and/or detected by their calls were identified, counted and their perpendicular distance to the transect line estimated. Each bird sighted was recorded independently and where there was a tight flock, the distance from the mid-point of the flock was recorded as the perpendicular distance of the birds to the transect. The data were analysed using the R software. The bird species accumulation curves, species richness and diversity indices were calculated using 'Vegan' version 2.5–6. The abundance was estimated using Rdistance version 2.1.3. The probability of detection and abundance was estimated for each species independently. Species whose observations were below the minimum number required to fit the detection function were excluded in the estimation of the overall density.

Results

A total of 20 transects totalling 24.83 km in length were covered by the survey over a period of seven days. A total of 6149 individuals of 151 species were recorded. The transect information, species richness, diversity, evenness, density and number of individuals counted are summarized in Table 1.

Table 1. Transect information, species richness, diversity and number of individuals counted during the bird surveyed in the Budalang'i Flood Plain, May 2019.

Site name	Transect number	Transect length (m)	Shannon-Wiener (H)	Species richness	No. of birds counted	Density (birds/ha)
Bukoma Beach	1	880	2.357	32	349	9.91
Bukoma Primary	2	1170	3.389	37	101	2.16
Narera Dyke	3	690	2.776	35	183	6.63
Aduma Dyke	4	700	2.861	30	122	4.36
Sigiri Dyke	5	1000	2.844	37	174	4.35
Galalani Dyke	6	1000	2.771	32	186	4.65
Mahoma Dyke	7	2000	2.927	47	357	4.46
Bunyala Rice Scheme1	8	1700	2.897	35	361	5.31
Bunyala Rice Scheme2	9	1600	2.039	27	657	10.27
Bunyala Rice Scheme3	10	1400	1.465	20	1259	22.48
Rwambwa1	11	2000	3.590	49	181	2.26
Rwambwa2	12	1000	2.911	30	125	3.13
Rwambwa3	13	1000	1.894	21	126	3.15
Rwambwa4	14	1000	3.248	37	133	3.33
Rapenda1	15	1200	3.629	51	284	5.92
Rapenda2	16	1200	1.428	41	691	14.40
Rapenda3	17	1200	3.007	29	150	3.13
Rapenda4	18	1300	3.173	47	266	5.12
Oluhongo Swamp	19	1160	3.588	52	248	5.34
Musoma Dyke	20	1630	3.507	46	196	3.01
Total	20	24830		151	6149	30.70

The species accumulation curve with the effort of covering twenty transects tended towards an asymptote which indicates that 151 species was a good estimate of the species richness for the area at the time of the study (Fig. 2).

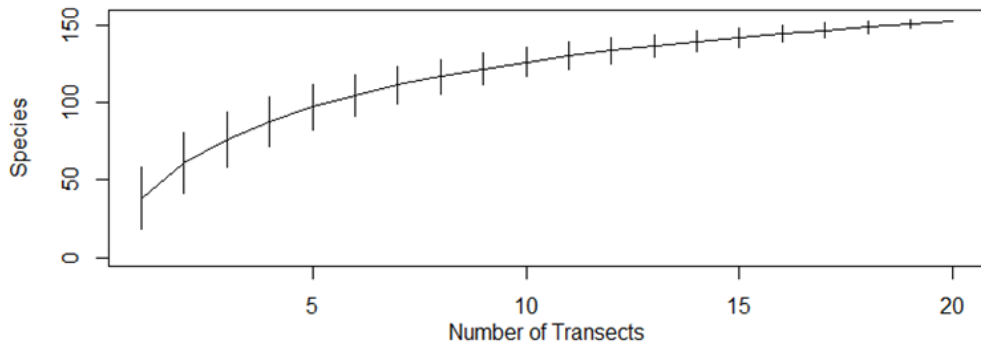


Figure 2. Bird species accumulation curve for the Budalang'i Flood Plain area, surveyed in May 2019.

The most numerous species encountered was *Anastomus lamelligerus* with 680 individuals, followed by *Columba guinea* with 673 individuals and *Ploceus pelzelni* with 448 individuals (see Appendix). The most encountered species was *Pycnonotus barbatus* 54 times, followed by *Laniarius erythrogaster* 46 times and *Cisticola galactotes* 44 times. The most abundant species was *Ploceus pelzelni* with a density of 4.40 birds/ha, followed by *Anastomus lamelligerus* with 2.38 birds/ha and *Columba guinea* with 2.37 birds/ha (Table 2).

Table 2. Estimated density of fourteen most abundant bird species in the Budalang'i Flood Plain, surveyed in May 2019.

Common name	Rank	Estimated density birds/ha	CI 95%	
			Low	High
<i>Ploceus pelzelni</i>	1	4.40	0.33	13.67
<i>Anastomus lamelligerus</i>	2	2.38	0.24	8.93
<i>Columba guinea</i>	3	2.37	0.18	6.21
<i>Ploceus melanocephalus</i>	4	2.22	1.16	3.78
<i>Ploceus cucullatus</i>	5	1.64	0.70	4.15
<i>Egretta garzetta</i>	6	1.52	0.21	4.61
<i>Pycnonotus barbatus</i>	7	1.50	0.85	2.49
<i>Sarkidiornis melanotos</i>	8	1.10	0.13	3.79
<i>Colius striatus</i>	9	1.02	0.43	2.25
<i>Ploceus jacksoni</i>	10	0.89	0.35	1.86
<i>Euplectes axillaris</i>	11	0.88	0.40	1.76
<i>Cisticola galactotes</i>	12	0.81	0.41	1.37
<i>Ceryle rudis</i>	13	0.78	0.32	1.60
<i>Bubulcus ibis</i>	14	0.75	0.28	1.57
Total	All	30.65	21.79	46.98

Discussion

This study brings out the current status of habitats and bird species in the Budalang'i Flood Plain. An estimate of 30 birds/ha for the entire study area is conservative since species whose number of observations fell below the minimum detection required were not included in deriving this estimate. In general, the most abundant and frequently encountered species were those associated with the farms. *Anastomus lamelligerus*, *Dendrocygna viduata* and *Egretta garzetta* are waterbirds that were associated with the flooded rice paddies and canals in the Bunyala Irrigation Rice Scheme. The common farmland birds were *Euplectes axillaris*, *Ploceus melanocephalus* and *P. cucullatus*. *Columba guinea*, *E. axillaris*, *P. melanocephalus* and *P. cucullatus* were among the main species that people were employed to scare away from the farms.

The Oluhungo swamp area, with 52 species, had the highest number. This swamp also recorded the presence of papyrus endemic species like *Laniarius mufumbiri*, *Cisticola carruthersi*, *Crithagra koliensis* and *Bradypterus carpalis*. With more intensive searches, it is very possible that the other papyrus endemic species such as *Chloropeta gracilirostris* could be found, and in higher abundance, in the swamps at Oluhungo and south of Bukoma Beach, which extends into the Yala Swamp IBA. Considering that this study area is adjacent to the Yala Swamp IBA, these data and information are important as baseline for assessing the ongoing ecological transformations that continue to threaten the highlighted endemic species in western Kenya. This study was done outside the Palaearctic migration period: species richness is expected to be higher during October to March when migrant species are present.

Acknowledgements

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Appendix. List of all bird species, number of individuals and their percentage frequency recorded during the survey in Budalang'i Flood Plain in May 2019. Taxonomy and nomenclature follow the fourth edition of the *Checklist of the Birds of Kenya* (EANHS 2009).

English name	Scientific name	Number of individuals	Number of encounters
Helmeted Guineafowl	<i>Numida meleagris</i>	13	3
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	32	8
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	357	5
Spur-winged Goose	<i>Plectropterus gambensis</i>	4	3
Knob-billed Duck	<i>Sarkidiornis melanotos</i>	141	10
Egyptian Goose	<i>Alopochen aegyptiaca</i>	4	1
Yellow-billed Stork	<i>Mycteria ibis</i>	3	2
African Open-billed Stork	<i>Anastomus lamelligerus</i>	680	20
Sacred Ibis	<i>Threskiornis aethiopicus</i>	4	1
Hadada Ibis	<i>Bostrychia hagedash</i>	32	11
Glossy Ibis	<i>Plegadis falcinellus</i>	14	2
African Spoonbill	<i>Platalea alba</i>	42	5
Little Bittern	<i>Ixobrychus minutus</i>	2	1
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	2	1
Striated Heron	<i>Butorides striata</i>	1	1
Squacco heron	<i>Ardeola ralloides</i>	6	4
Cattle Egret	<i>Bubulcus ibis</i>	223	26
Grey Heron	<i>Ardea cinerea</i>	4	4
Black-headed Heron	<i>Ardea melanocephala</i>	11	9
Purple Heron	<i>Ardea purpurea</i>	3	3
Great White Egret	<i>Ardea alba</i>	21	3
Little Egret	<i>Egretta garzetta</i>	265	21
Hamerkop	<i>Scopus umbretta</i>	69	19
Great White Pelican	<i>Pelecanus onocrotalus</i>	48	2
Reed Cormorant	<i>Phalacrocorax africanus</i>	8	6
African Black-shouldered Kite	<i>Elanus caeruleus</i>	9	7
Black Kite	<i>Milvus migrans</i>	1	1
Black-chested Snake Eagle	<i>Circaetus pectoralis</i>	1	1
Western Banded Snake Eagle	<i>Circaetus cinerascens</i>	3	3
African Harrier Hawk	<i>Polyboroides typus</i>	2	2
Gabar Goshawk	<i>Micronisus gabar</i>	1	1
Long-crested Eagle	<i>Lophaetus occipitalis</i>	7	6
Black Crane	<i>Amaurornis flavirostra</i>	4	2
Purple Swampphen	<i>Porphyrio porphyrio</i>	2	1
Grey Crowned Crane	<i>Balearica regulorum</i>	4	2
Water Thick-knee	<i>Burhinus vermiculatus</i>	8	4
Black-winged Stilt	<i>Himantopus himantopus</i>	76	3
Long-toed Plover	<i>Vanellus crassirostris</i>	29	4
Spur-winged Plover	<i>Vanellus spinosus</i>	47	10
Brown-chested Plover	<i>Vanellus superciliosus</i>	20	1
African Jacana	<i>Actophilornis africanus</i>	40	14
Speckled Pigeon	<i>Columba guinea</i>	674	15
African Mourning Dove	<i>Streptopelia decipiens</i>	46	20
Red-eyed Dove	<i>Streptopelia semitorquata</i>	51	24
Ring-necked Dove	<i>Streptopelia capicola</i>	4	1

English name	Scientific name	Number of individuals	Number of encounters
Laughing Dove	<i>Streptopelia senegalensis</i>	13	7
Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>	4	3
Blue-spotted Wood Dove	<i>Turtur afer</i>	74	38
African Green Pigeon	<i>Treron calvus</i>	7	2
Meyer's Parrot	<i>Poicephalus meyeri</i>	3	2
Eastern Grey Plantain-eater	<i>Crinifer zonurus</i>	31	12
Jacobin Cuckoo	<i>Clamator jacobinus</i>	1	1
Red-chested Cuckoo	<i>Cuculus solitarius</i>	13	11
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	3	3
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	12	10
Blue-headed Coucal	<i>Centropus monachus</i>	10	8
White-browed Coucal	<i>Centropus superciliosus</i>	14	10
African Palm Swift	<i>Cypsiurus parvus</i>	13	6
White-rumped Swift	<i>Apus caffer</i>	4	1
Speckled Mousebird	<i>Colius striatus</i>	89	31
Blue-naped Mousebird	<i>Urocolius macrourus</i>	10	4
Broad-billed Roller	<i>Eurystomus glaucurus</i>	14	5
Grey-headed Kingfisher	<i>Halcyon leucocephala</i>	30	22
Woodland Kingfisher	<i>Halcyon senegalensis</i>	16	13
Malachite Kingfisher	<i>Alcedo cristata</i>	11	8
Pied Kingfisher	<i>Ceryle rudis</i>	109	24
Little Bee-eater	<i>Merops pusillus</i>	1	1
White-throated Bee-eater	<i>Merops albicollis</i>	37	6
Green Wood-hoopoe	<i>Pheoniculus purpureus</i>	5	2
Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>	3	3
Black-billed Barbet	<i>Lybius guifsobalito</i>	1	1
Greater Honeyguide	<i>Indicator indicator</i>	3	2
Nubian Woodpecker	<i>Campethera nubica</i>	2	1
Black-headed Batis	<i>Batis minor</i>	4	2
Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>	1	1
Marsh Tchagra	<i>Tchagra minutus</i>	5	4
Black-crowned Tchagra	<i>Tchagra senegalus</i>	2	1
Papyrus Gonolek	<i>Laniarius mufumbiri</i>	20	6
Black-headed Gonolek	<i>Laniarius erythrogaster</i>	99	46
Grey-backed fiscal	<i>Lanius excubitoroides</i>	23	12
Black-headed Oriole	<i>Oriolus larvatus</i>	1	1
Common Drongo	<i>Dicrurus adsimilis</i>	16	9
African Paradise Flycatcher	<i>Terpsiphone viridis</i>	9	4
White-headed Saw-wing	<i>Psaldiprocne albiceps</i>	7	4
Black Saw-wing	<i>Psaldiprocne pristoptera</i>	7	4
Plain Martin	<i>Riparia paludicola</i>	65	3
Barn Swallow	<i>Hirundo rustica</i>	12	4
Blue Swallow	<i>Hirundo atrocaerulea</i>	2	1
Lesser Striped Swallow	<i>Cecropis abyssinica</i>	44	13
Winding Cisticola	<i>Cisticola galactotes</i>	76	44
Carruthers's Cisticola	<i>Cisticola carruthersi</i>	10	3
Zitting Cisticola	<i>Cisticola juncidis</i>	1	1
Tawny-flanked Prinia	<i>Prinia subflava</i>	15	10

English name	Scientific name	Number of individuals	Number of encounters
Grey-capped Warbler	<i>Eminia lepida</i>	61	40
Grey-backed Camaroptera	<i>Camaroptera brachyura</i>	41	25
Common Bulbul	<i>Pycnonotus barbatus</i>	175	54
Little Rush Warbler	<i>Bradypterus baboecala</i>	4	3
White-winged Swamp Warbler	<i>Bradypterus carpalis</i>	10	6
Greater Swamp Warbler	<i>Acrocephalus rufescens</i>	5	5
Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>	1	1
Red-faced Crombec	<i>Sylvietta whytii</i>	2	1
Black-lored Babbler	<i>Turdoides sharpei</i>	26	5
African Yellow White-eye	<i>Zosterops senegalensis</i>	4	1
Rüppell's Starling	<i>Lamprotornis purpuroptera</i>	59	21
Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>	7	4
Yellow-billed Oxpecker	<i>Buphagus africanus</i>	8	2
African Thrush	<i>Turdus pelios</i>	16	13
White-browed Robin Chat	<i>Cossypha heuglini</i>	4	3
Brown-backed Scrub Robin	<i>Cercotrichas hartlaubi</i>	4	4
Northern Black Flycatcher	<i>Melaenornis edoloides</i>	8	5
Swamp Flycatcher	<i>Muscicapa aquatica</i>	14	7
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	6	3
Scarlet-chested Sunbird	<i>Chalcomitra senegalensis</i>	2	2
Beautiful Sunbird	<i>Cinnyris pulchellus</i>	8	5
Marico Sunbird	<i>Cinnyris mariquensis</i>	51	22
Red-chested Sunbird	<i>Cinnyris erythrocerus</i>	12	4
Variable Sunbird	<i>Cinnyris venustus</i>	3	2
Superb Sunbird	<i>Cinnyris superbus</i>	2	1
Copper Sunbird	<i>Cinnyris cupreus</i>	4	2
White-browed Sparrow Weaver	<i>Plocepasser mahali</i>	8	2
House Sparrow	<i>Passer domesticus</i>	5	2
Kenya Rufous Sparrow	<i>Passer rufocinctus</i>	2	1
Grey-headed Sparrow	<i>Passer griseus</i>	21	8
Baglafaecht Weaver	<i>Ploceus baglafaecht</i>	2	1
Slender-billed Weaver	<i>Ploceus pelzelni</i>	448	13
Little Weaver	<i>Ploceus luteolus</i>	45	15
Spectacled Weaver	<i>Ploceus ocularis</i>	1	1
Lesser Masked weaver	<i>Ploceus intermedius</i>	21	4
Village Weaver	<i>Ploceus cucullatus</i>	192	23
Yellow-backed Weaver	<i>Ploceus melanocephalus</i>	270	43
Golden-backed Weaver	<i>Ploceus jacksoni</i>	97	18
Cardinal Quelea	<i>Quelea cardinalis</i>	14	4
Red-billed Quelea	<i>Quelea quelea</i>	68	3
Black Bishop	<i>Euplectes gierowii</i>	14	8
Southern Red Bishop	<i>Euplectes orix</i>	12	2
Fan-tailed Widowbird	<i>Euplectes axillaris</i>	156	34
Common Waxbill	<i>Estrilda astrild</i>	43	6
Black-crowned Waxbill	<i>Estrilda nonnula</i>	1	1
Red-cheeked Cordon-bleu	<i>Uraeginthus bengalus</i>	31	12
Brown Twinspot	<i>Clytospiza monteiri</i>	4	1
Red-billed Firefinch	<i>Lagonosticta senegala</i>	16	10

English name	Scientific name	Number of individuals	Number of encounters
Bronze Mannikin	<i>Spermestes cuculatus</i>	71	14
Pin-tailed Whydah	<i>Vidua macroura</i>	28	8
Village Indigobird	<i>Vidua chalybeata</i>	13	8
African Pied Wagtail	<i>Motacilla aguimp</i>	25	12
Plain-backed Pipit	<i>Anthus leucophrys</i>	2	1
African Citril	<i>Crithagra citrinelloides</i>	3	2
Papyrus Canary	<i>Crithagra koliensis</i>	2	1
Reichenow's Seedeater	<i>Crithagra reichenowi</i>	4	2
Yellow-fronted Canary	<i>Crithagra mozambica</i>	21	8
Brimstone Canary	<i>Crithagra sulphurata</i>	2	1
Total number of individuals		6149	
Total number of species		151	