

## SPECIES COMPOSITION, ABUNDANCE AND ACTIVITY PATTERN OF BIRDS IN ADDIS ABABA ABATTOIRS ENTERPRISE AREA

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**ABSTRACT:** Studies on species composition and abundance of birds in Addis Ababa Abattoirs Enterprise compound were carried out from March 2006 to February 2007. Point count method was employed to record the abundance of individual bird species. Twenty one species of birds, including the endemic Wattled Ibis, White-collared Pigeon and Thick-billed Raven were recorded. Of the total species, 12 (57.14%) were regular, 4 (19.05%) were resident and 5 (23.81%) were irregular. The species composition decreased during the wet season due to the departure of migratory birds. But, the abundance of birds during the wet season was greater than during the dry season. The most abundant species were hooded and African white-backed vultures. The activity time was from 06: 00 – 18:00 h during the dry season. The fresh dumping site was intensively disturbed by human activities, affecting the normal feeding behaviour of birds.

**Key words/phrases:** Avian species, Density, Ethiopia, Raptors.

### INTRODUCTION

Studies on the ecology of the bird fauna of Ethiopia is in its infancy. According to Avibase (2006), out of the 926 bird species listed for the country, 21 are endemic and 19 are globally threatened. Even though the main concentration of wildlife in Ethiopia appears to be localized in the south and western half of the country, Addis Ababa has quite a diverse flora and harbours different species of birds, including endemics. Among the area controlled by Addis Ababa Water and Sewage Authority, Gefersa Reservoir site supports at least 20 highland biome species. Urban (1991) studied Palaearctic and Afro-tropical ducks and geese at Gefersa, over a 6-year period.

Every major habitat presents special conditions of life and, usually, peculiar problems of existence for birds. Birds occupying a given habitat are adapted to exploit these conditions. As a group, birds are closely associated with forests. However, the available food source coupled with enough space for perching has offered the Addis Ababa Abattoirs Enterprise (AAAE) a

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suitable environment for a wide range of bird species.

Global biodiversity is being degraded at an alarming rate due to human activities (Skole and Tucker, 1993). Of the three leading causes of species endangerment (urbanization, agriculture, and interactions with non-native species), urbanization ranks highest (Czech and Krausman, 1997; Czech *et al.*, 2000). In the past, ecologists paid little attention to urban ecosystems and focused mainly on pristine ones (Blair, 2004; Collins *et al.*, 2000). Urban areas are characterized by high levels of disturbances and environmental modification, which can affect bird populations and community patterns (Rebele, 1994; Blair, 1996). Urban sprawl may occur even faster in developing nations, which are currently rich in biodiversity (Liu *et al.*, 2003).

The demand for more living space for the rapidly expanding human population of Addis Ababa is threatening the habitat. The composition of the avifauna in abattoirs is known to be rich. However, no study has been carried out to describe the types of species and abundance of birds in the area and their response to habitat disturbance and destruction. Thus, the present study on the species composition, abundance and activity pattern of birds of AAAE is intended to add further information on the avian fauna in a fast developing African capital city, Addis Ababa.

## MATERIALS AND METHODS

### The study area

AAAE is located in the centre of Addis Ababa at  $8^{\circ} 59' 433$  E and  $38^{\circ} 44' 462$  N. It covers an area of about 38,141 m<sup>2</sup>. The site, in addition to buildings, also harbours piles of bones, dumps of scraps and offal. It provides a huge amount of scraps used as a reliable food source for all scavenging species of birds throughout the year. The dumping site covers a limited area of land over which scavenger birds fly and feed (Fig.1). Surrounding the enterprise are buildings with dense human population.

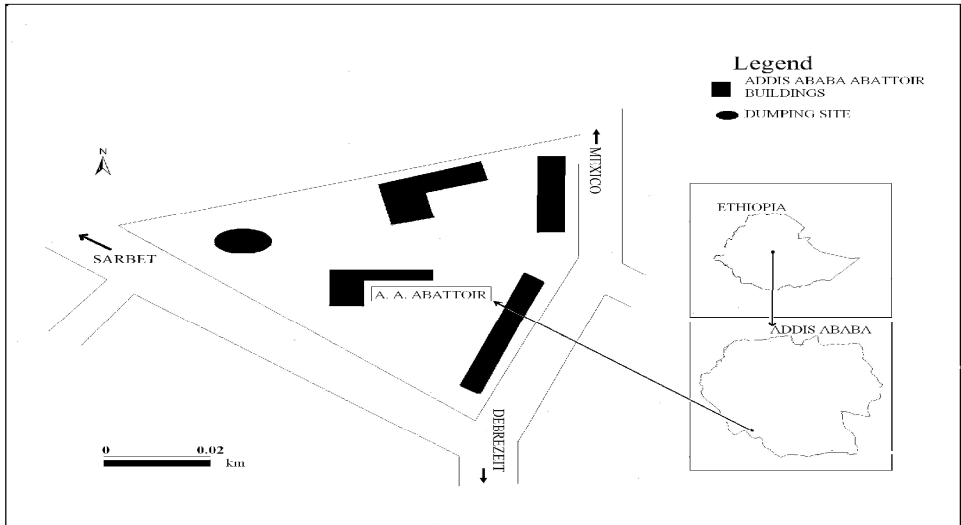


Fig. 1. Site of Addis Ababa Abattoir Enterprise.

### Data collection and analyses

Studies on the composition, abundance and activity pattern of bird species around the study area were carried out from March, 2006 to February, 2007, two full days a week, for a total of 98 days.

Species were identified using the manual of Perlo (1995) and Sinclair and Ryan (2003) and categorized into: residents (birds observed during the whole study period), regular (birds observed for a considerable part of the year or at different months), and irregular (birds observed only once or a few times during the study period) (Karr, 1976). The abundance of birds in and around AAAE was studied using a modified point count method following Bibby *et al.* (1992) and Pomeroy (1992). Census data were collected twice a day, morning and late afternoon. Bird activity surveys were conducted from dawn to dusk. Two suitable sites of high ground were selected to observe the activities. A hand tally counter was employed for counting. Immature and adult vultures were recorded to determine their proportion.

Informal interviews were conducted with the workers of the enterprise and the surrounding community to assess their attitude towards birds; whether they knew about the diversity, abundance, endemic and seasonal variability on the composition of the species; and whether they prohibit or encourage netting or killing birds.

For analyses, species recorded in more than 30% of the study period were included. Abundance was established by calculating the mean species abundance from the census.

Descriptive statistics and correlation coefficients were used to analyze the diversity, abundance and relationship of the major bird species.

## RESULTS

### Species composition and abundance

A total of 21 species of birds including three endemics (wattled ibis, white-collared pigeon and thick-billed raven) were recorded in the study area. All species used the site for feeding and perching. Resident birds comprised 19.05%, while 57.14% and 23.81% were regular and irregular birds, respectively (Table 1). Seasonal fluctuations in the number of species were observed (Fig. 2). Migratory birds such as sacred ibis, wattled ibis, yellow billed kite and yellow wagtail abandon the area during late June and early July. In August, except wattled ibis, other migrant birds were not observed. They reappeared after mid-September.

Table 1. Category of birds based on frequency of occurrence.

Resident	Regular	Irregular
Wattled Ibis	Hamerkop	Wooly-necked Stork
Hooded Vulture	Marabou	Tawny Eagle
African White-backed Vulture	Sacred Ibis	White-collared Pigeon
Pied Crow	Yellow billed Kite	Cape Crow
	Rueppell's Griffon	Glossy-Starling
	Speckled Pigeon	
	African Mourning Dove	
	Red-rumped Swallow	
	Yellow Wagtail	
	Mountain Wagtail	
	Thick-billed Raven	
	Red-billed Fire finch	

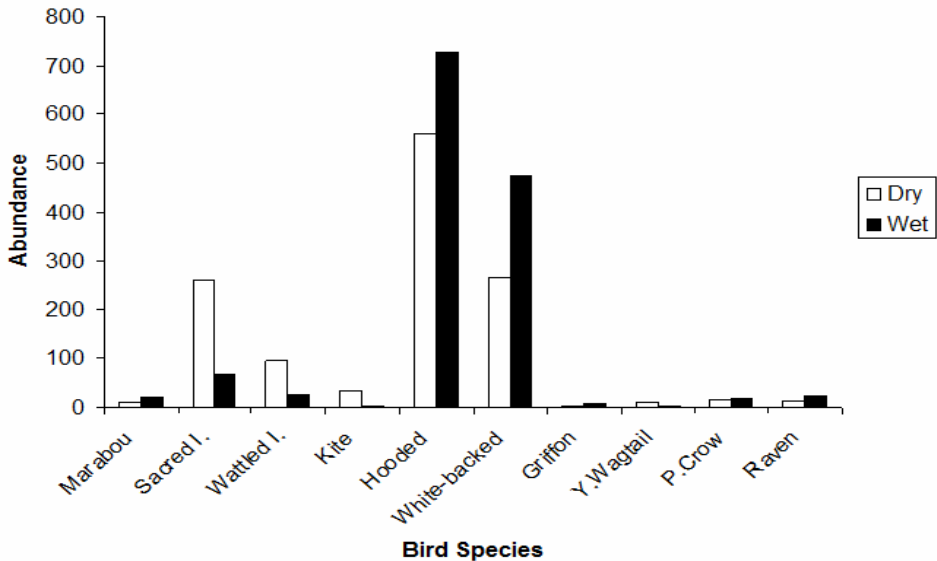


Fig. 2. Abundance of dominant bird species in the study area during wet and dry seasons.

The occurrence of species varied depending on the season rather than the period of time. Hooded vulture, African white-backed vulture, pied crow and wattled ibis were observed throughout the study period. The most numerous species were hooded and white-backed vultures. The mean total  $\pm$  SD for each species were as follows:- marabou ( $14.9 \pm 15.98$ ), sacred ibis ( $191.4 \pm 128.03$ ), wattled ibis ( $71.2 \pm 47.48$ ), yellow billed kite ( $22.3 \pm 24.27$ ), hooded vulture ( $618.7 \pm 152.84$ ), white-backed vulture ( $339.0 \pm 149.29$ ), griffon vulture ( $5.6 \pm 5.21$ ), yellow wagtail ( $7.3 \pm 8.47$ ), crow ( $16.6 \pm 6.24$ ) and raven ( $15.7 \pm 15.99$ ). There were fluctuations in numbers of adult and immature hooded and African white-backed vultures (Table 2). There was no significant difference in the number of immature hooded and African white-backed vultures during wet and dry seasons.

Correlation among the different species of dominant birds is given in Table 3. The monthly abundance of marabou stork does not show linear relationship with wattled ibis, hooded and African white-backed vulture. The same was true between the thick-billed raven with wattled ibis and yellow billed kite. The negative linear relationship between the species was 42% and the positive linear relationship was 49%.

Table 2. Abundance of adult and immature Hooded and African White-backed Vultures during the wet and dry seasons.

Season	Sample	Hooded Vulture			African White-backed Vulture		
		Adult	Immature	Total	Adult	Immature	Total
Wet	1	477	335	812	313	182	495
	2	470	309	779	295	194	489
	3	410	315	725	237	189	426
	4	430	299	729	297	206	503
	5	428	297	725	256	173	429
Dry	1	479	275	754	274	147	421
	2	231	354	585	49	185	234
	3	219	314	533	42	205	247
	4	189	307	496	34	181	215
	5	176	219	395	3	43	46

Table 3. Correlation among dominant bird species in the study area.

	Marabou	Sacred	Wattled	Kite	Hooded	White Backed	Griffon	Wagtail	Crow
Sacred I.	-0.3								
Wattled I.	0	0.8							
Kite	0.2	0.7	0.9						
Hooded V.	0	-0.6	-0.6	-1					
White-backed V.	0	-0.6	-0.7	-1	0.9				
Griffon V.	0.1	-0.6	-0.6	-1	0.9	1			
Wagtail	0.2	0.6	0.7	0.9	-0.7	-0.8	-0.7		
Crow	0.1	-0.3	-0.4	-1	0.8	0.8	0.8	-0.5	
Raven	0.4	-0.5	0	0	0.5	0.3	0.5	-0.2	0.2

The head, lower leg parts (fresh and boiled), piece of hides, and mixed pieces of bones, meat and blood of slaughtered animals constituted the main food source for birds in the study area. The scraps were dumped twice a day, in the morning, fresh scrap (09:00 – 10:30 h) and in the afternoon, boiled hoof (15:00 – 15:30 h). Up to one hundred cart of powdered scraps are piled daily and mixed with the effluent between 10:00 and 10:30 h. Different species of birds congregated to feed when the discharge was deposited at the edge of the river. There were differences in the number of animals

slaughtered from month to month, and between different days within the same month (Table 4). The highest number of oxen slaughtered for Christians was 1353 on 05/07/06 and for Muslims it was 95 on 23/09/06. Comparatively few numbers of animals were slaughtered during February - April. The annual estimated total scrap was 7,052,500 kg from cattle and 700,000 kg from sheep and goats.

Table 4. Number of animals slaughtered per month during 2006/2007.

Month	Slaughtered Animals				
	Cattle	Sheep	Goats	Pigs	Total
March	4862	4540	703	91	10196
April	10119	3346	547	98	14110
May	14209	5519	779	125	20632
June	10864	5032	638	84	16618
July	15541	5579	756	73	21949
August	13014	6357	650	101	20122
September	13684	6924	653	119	21380
October	13814	6801	743	104	21462
November	13258	6272	753	105	20388
December	12119	6896	636	106	19757
January	13368	6720	684	107	20879
February	4669	6828	729	112	12338
Total	139521	70814	8271	1225	219831

### Activity patterns

On several occasions during the dry season, birds were observed at the site even before 06:00 h. The first to arrive at the site was hooded vulture and the last was griffon vulture. Most of the birds after reaching the area perch on the nearby structures for a while. Conflict at the feeding site was frequent among vultures in areas where fresh scraps were disposed. Kites spent long periods in low searching flight, seeking offal. When fresh scraps were

dumped, numerous short flights were made between the dumping and roosting sites. There were differences in the skill of individual vultures in obtaining food and in the reaction on intruders. Griffon and African white-backed vultures, when disturbed, abandon their feeding sites and fly away from the study area. While hooded vultures perch on the roofs of the abattoir.

The fresh dumping site was intensively disturbed by human activities. When the workers and beneficiaries leave the area, the first to land were half-a-dozen hooded vultures followed by more potential competitors. More than 97% of the fresh dumping area was covered by griffon and African white-backed vultures. They frequently exhibited threat displays when defending the fresh scraps. Defense of favourite feeding ground was occasionally observed by the dominants when less amount of scrap was disposed. In such cases, much time was spent in fighting and only limited time was available for feeding. Until the dominant satiated, others raked away the old scraps with their bills to obtain food. When big fleshy offal is identified by any vulture, there will be a squabbling melee of 10-20 dominant vultures among which all manage to get something. After a heavy meal, some of the vultures flew away to safe perching or roosting sites. Others rested on the mounds.

Ibis were never observed on fresh dumping site in the morning. They searched on the old scraps, mainly around the effluent. In the afternoon, several places were covered by ibis and kites. In April and May, hooded vulture and wattled ibis were observed using their bill to probe into soft ground for insects around the farm yards and bushes near the dumping site. Thick-billed ravens collected their food from the fresh dumping site and around the effluent. The marabou fed on old and fresh scrap pieces of meat and worms. They usually swallowed the tail part and the male genital organs from the fresh scraps, which were not used by other birds. Marabous were also observed snatching food from vultures.

Trees within 2 km radius from the study area were active roosting sites for different species of birds. However, large numbers of sacred ibis were observed flying from the southeast direction and most of the vultures were observed flying from the southwest direction.

Griffon vultures left the area first at about 16:30 h, then the African white-backed vulture and marabous disappeared from the area. The sacred ibis were observed perching on the roof before they flew to their roosting sites. There was no consistency in the departure time of pied crow and raven.



Wattled ibis and kites were the last to depart from the dumping ground.

### DISCUSSION

The present study area was used by different groups of birds, including wetland birds and passerines. A noticeable characteristic of the bird census in the area was the presence of species that utilized the habitat only as a food source. The feeding site is not a protected area from other animals, including humans. The human beneficiaries from the scrap are the major source of disturbance for the normal activities of birds and this phenomenon has greatly affected the species composition and abundance. Disturbance and other extra factors influence urban bird populations and communities as stated by Rebele (1994).

Seasonal fluctuations in the abundance of individual species were extreme. Birds were able to find suitable food sources in this habitat and consequently different species were observed in the area during the wet season. This is related to the findings of Jokimaki *et al.* (2002) that different habitat features affect the habitat selection of wintering birds. Some birds, however, were not affected, even if there was a change in weather conditions, provided enough food was available.

Although ibises are not strictly meat-eating species, sacred ibis and wattled ibis were observed in large numbers. The availability of food might be the main reason to see numerous individuals. Sacred ibis were usually observed in the site in high numbers. These birds were mostly observed searching their food on old dumping grounds, usually looking for different invertebrates. The composition and abundance of these invertebrates were not investigated and further study is needed to assess the diversity of these species.

Fluctuation in the number of adult and immature hooded and African white-backed vultures shows that some of the birds were either new visitors or may use other feeding sites. The number of hooded and African white-backed vultures did not decline significantly in the area until the first week of November. The decline in the number from November onwards was also confirmed from their roosting sites. This might be related to their breeding season. Hence, during the dry season after November, the percentage of immature vulture increases in the study area.

During holidays, the number of hooded vulture visiting the area decreased from the usual time. The main reason was that people have traditional culture to slaughter animals by forming groups in their surroundings,

institutions and enterprises. Due to this, waste and leftovers are disposed in various parts such as sewage channels, on the streets and garbage dumps. The hooded vultures, therefore, need not visit the study area to locate offal and scraps on such days.

The raven population during September was substantially higher than in the other months. During September, there are two major Ethiopian festivals (New Year and Meskal), for which large number of cattle are slaughtered at different localities. So, the dispersion of hooded vultures in these localities might force ravens to feed in the abattoirs.

Scraps of slaughtered animals are the major food sources in the abattoirs. The volume of scraps fluctuated from time to time. It is hard to give precise data on whether or not, and how often, the numbers of animals are slaughtered since it depends on circumstances such as the demand of the market. The range of slaughtered animals per day varied depending upon the Orthodox Christian fasting period and holidays.

Different species of birds were usually seen throughout the day around the study area. There was a strong interaction between the dumping site characteristics, the presence of abundance or competitive species and the composition of bird assemblages. Most species were active at certain times of the day. Their activity and the time spent for different activities varied with the weather pattern, length of the day and availability of fresh food. Birds do not wander indiscriminately, but confine their activities within local, measurable areas, mainly where fresh scraps were dumped.

The availability of food and the interference by humans were the major factors compared to the weather in affecting the activity of birds in the area. Although the people concerned in running the abattoir took some measures to prevent the presence of men in the dumping site, the measures were not effective. Due to human interference, birds were forced to change their normal feeding period. Occasionally, they were observed feeding during mid-day, especially in relatively undisturbed areas. Yellow billed kites are fearless birds during searching flight for food (Sinclair and Ryan, 2003). They often flew swooping down to snatch meat from other birds. They even snatched from the human beneficiaries with agile twists and turns.

Vultures tend to co-occur with other species. They were always first to arrive at the feeding site. As vultures are capable of staying for long periods without feeding as described by Gracia-Rodriguez *et al.* (1987), even when there is no human disturbance, many vultures aggregate at the dumping site,

but only a few feed actively on the scraps. When the number of human beneficiaries increased, birds retreated to mounds or roofs or moved away and roosted for a while. As described by Mark (1998), vultures are actually shy of humans.

Hooded vulture and wattled ibis were the commonest birds frequently seen feeding on the powdered scraps deposited around the river bank. Sometimes yellow billed kites and African morning doves were also included. This feeding habit of raptors is clearly different from the literature, feeding on a broad array of invertebrates and vertebrates in all natural and artificial habitats (Thiollay, 2006). This is presumably because these birds are well adapted to the area, and thus, have developed unique features to satisfy their needs.

Hooded vultures supplement scraps with insects and dung. Therefore, they might be less dependent on fresh scraps than the other vultures. Hooded vulture uses the slender bill to pick at large carcasses after other scavengers leave, or to probe into dung and soft ground for insects (Sinclair and Ryan, 2003).

Birds were observed approaching the study area from different directions, where enough roosting trees were located. The roosting sites were localized on trees, far from human activities or in secured places such as institutions, churches, near to hill sides and rivers. This goes in line with the findings of Melles (2005) who described birds roosting in the downtown core of Vancouver, which is close to the urban dwellings.

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