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# The increasingly urban status of the Cattle Egret *Bubulcus ibis* in Uganda, with some observations on its variable breeding seasons and associated species

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## Summary

Cattle Egrets *Bubulcus ibis*, long known for their expanding geographical range, have in recent years also become increasingly urbanized in Kampala, a city with over 1.5 million people, and elsewhere. First recorded roosting in Kampala over 15 years ago, their numbers now exceed 16000, spread across several sites, at most of which they have also been breeding for several years. However, the numbers nesting are far lower than might be expected from those that come nightly to roost. Breeding in Kampala shows bimodal peaks, perhaps because some birds breed twice a year – which would partly explain their rapid increase in numbers. Timing of breeding is linked to rainfall, but shows more variation between sites and between years than might be expected. Some birds may always have fed in the area that is now Kampala. Today, some feed at the city's main land-fill site, but most go to the countryside where their consumption of bush-cricket, grasshoppers and other insects is presumably beneficial to farmers. Overall, for breeding and roosting, and to some extent feeding, Cattle Egrets can now be considered as urbanized in this near-equatorial city.

## Introduction

The process of urbanization in birds is generating increasing interest around the world. There are even books on urban bird-watching (e.g. Milne 2006, which includes Kampala, mentioning Cattle Egrets *Bubulcus ibis* and many other species). The process can involve remarkable changes of behaviour as seen, for example, in Marabou Storks *Leptoptilus crumeniferus* in Kampala (Pomeroy 1978), whilst the Australian White Ibis *Threskiornis moluccus* has not only colonized urban areas, but has become a pest (Martin *et al.* 2012). In Britain, Evans *et al.* (2010), using the Blackbird *Turdus merula* as an example, propose a model in which urbanization proceeds in three stages – arrival, adjustment and spread. As we shall see, Cattle Egrets may have skipped the first of these stages.

In the city of Kampala an increasing number of bird species is well established within the most urban parts (Chamberlain *et al.* in press), and this includes the Cattle Egret. This species is also spreading globally, to become one of the most cosmopolitan of birds (del Hoyo *et al.* 1992). From having long been widespread in Africa they have, in the past 40 years or so, been spreading northwards from the western Mediterranean basin, first breeding in France in 1989 (Snow & Perrins 1998) and in England in 2008, where their spread is continuing (Balmer *et al.* 2013). Although Brown *et al.*

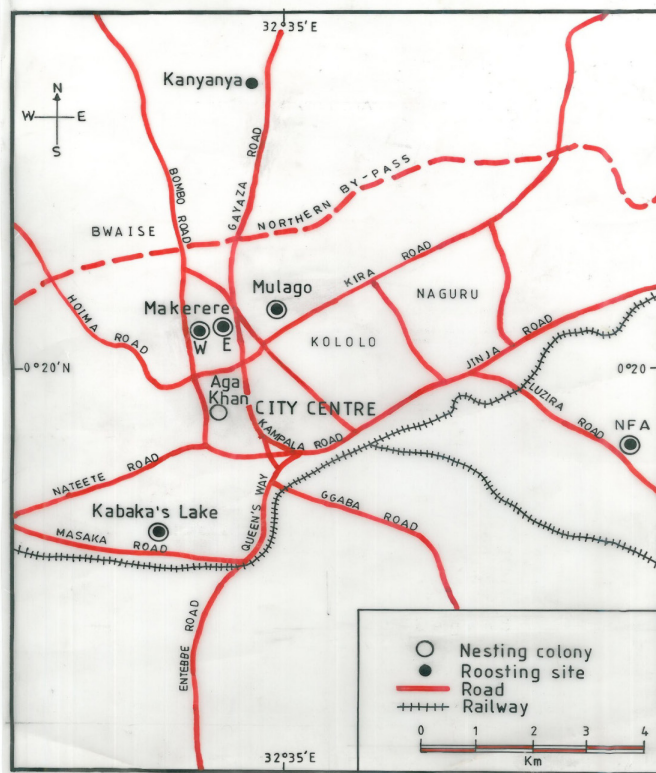
(1982) does not mention that the species was spreading in Africa at that time, there have been many subsequent reports of it doing so, and of increases within its traditional range (e.g. Kushlan & Hafner 2000). This could imply a high reproductive rate, and Brown *et al.* (1982) states that although they mostly start breeding at the age of two, some start earlier. Also significant, perhaps, is that they may breed more than once a year, as suggested below.

In both East and West Africa, Cattle Egrets are a common sight in urban areas, including Dakar, Nairobi and Dar es Salaam (C. Barlow, D.A. Turner, pers. comm.), although they often continue to roost outside of urban centres. Urban nesting is known from Nairobi (where Cattle Egrets have recently begun nesting together with Sacred Ibis *Threskiornis aethiopicus*, D.A. Turner pers. comm.) and several places in Uganda, including Busolwe and Mbale (Nachuha 2007) as well as Kampala.

In this paper, we describe how the number of roosting sites, and the number of roosting birds, have continued to rise and so too have the numbers nesting, sometimes in mixed colonies, and almost throughout the year. We also compare nesting success in mixed and single-species colonies.

## Methods

The locations of the various roosts and nesting colonies in Kampala are shown in Fig. 1. They were found by personal observation, supplemented in one case by a helpful informant. Although it is hard to be certain, we believe that all sites have been found; birds flying into roost were probably all seen since they tended to follow the main valleys.



**Figure 1.** Map of the central parts of Kampala, showing the positions of all known nesting and roosting sites in 2016 (NFA = National Forest Authority, Bugolobi). The total area of Kampala City is 190 km<sup>2</sup>, so it extends well beyond the area shown.

Cattle Egrets lend themselves to total counts. Nest and roost counts were made in the months from mid-2012 to early 2013, and then monthly at Makerere during 2013, and at all sites throughout 2014 and 2015, usually around the middle of the month. At Kabaka's Lake, where the largest numbers of both nesting and roosting birds were found, some of the nests were in two acacia trees beside the lake, and others on two small islands within the lake, which we accessed by boat. In 2015, additional observations were made to assess breeding success, which was deduced from weekly counts at two colonies, at Makerere and NFA Bugalobi. The number of young fledged was assumed to be the number of grown young present in the nests at the last count. The nests at Makerere were in trees that also had Marabou Stork nests, whilst trees at Bugolobi were only used by Cattle Egrets. Marabou nests were located in the crown of the tree, above those of the egrets.

Roost counts were also made monthly. Beginning at least an hour before sunset, flocks of birds were counted as they arrived. Counting continued so long as birds continued to arrive, by which time it was often completely dark apart from light from the sky and local electric lights (which may have helped the birds to come so late to roost). Most incoming flocks were quite small, the majority consisting of fewer than 25 birds, and hence easily counted.

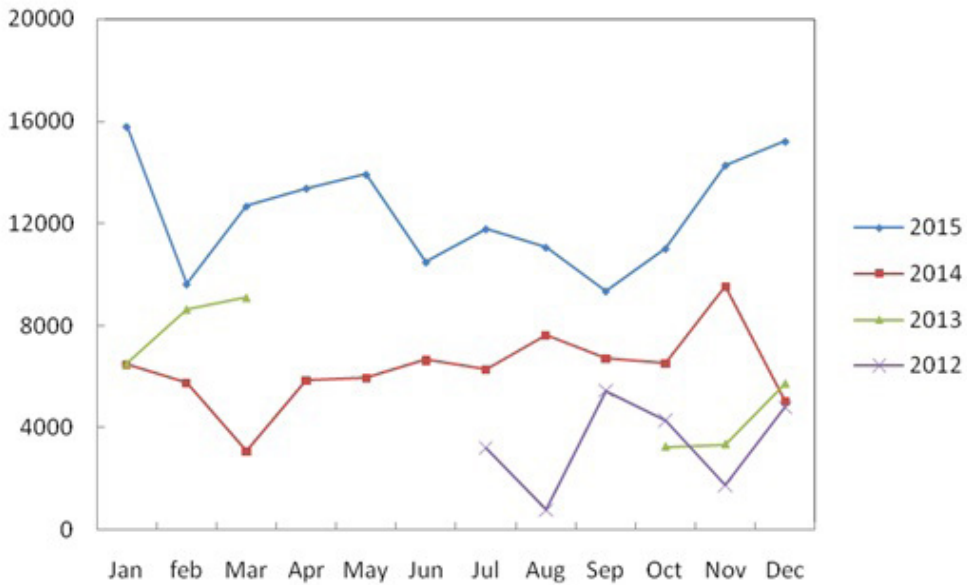
Observations of feeding behaviour were mainly opportunistic, except at the city's land-fill site where monthly counts were made from 2013 to 2016.

## Results

### *Kampala roosts*

By the 1980s Cattle Egrets were common in Kampala City, feeding on grassed verges and roundabouts. However, there was no record of them roosting or nesting in the city at that time (Carswell 1986). The first documented record was in 2000, when an average count of 4669 was recorded for birds roosting on acacia trees and shrubs on islands within the 3-ha Kabaka's Lake at Mengo, about 3 km southwest of the city centre (Banage & Pomeroy 2000). The size of this roost suggested that it must already have existed for some years before 2000—and it has been in continuous use since then; it is now also the site of the biggest nesting colony. Subsequently, a number of other roosting sites have been found in various parts of the city.

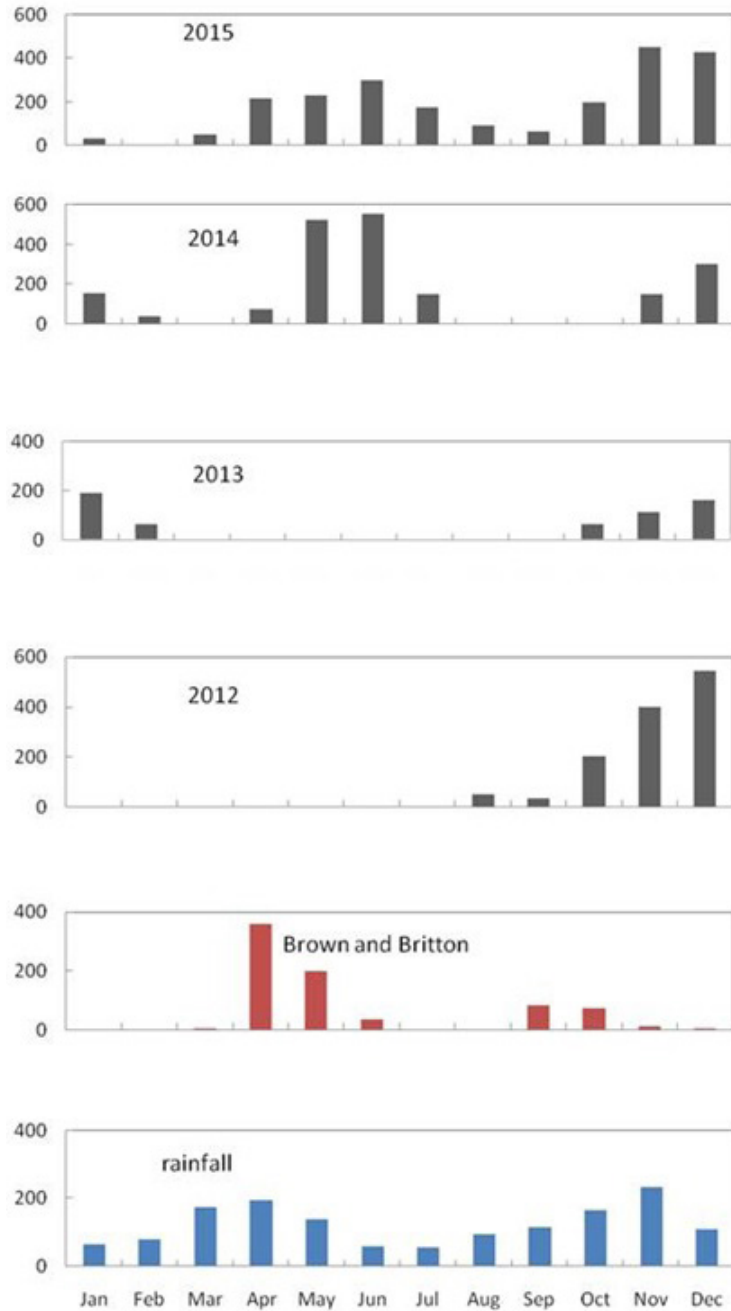
Fig. 1 shows all known roosting and nesting sites in Kampala; all except that at the Aga Khan School (where the roosting trees were cut down) were still in use in 2016. Fig. 2 shows combined monthly counts of all known roosts from January 2014 to the end of 2015, together with data from shorter periods in 2012 and 2013. As can be seen, numbers fluctuated between successive months, but with no strong seasonal pattern. The general increase over these four years is clear. Monthly variations were probably due in part at least, to difficulties in counting, but could also be attributable to some birds changing roosts, and the possibility that there were nearby roosts that were still unknown to us. For example, local people told us that the one on Gayaza Road had been there for some time before it was first counted in November 2015. This is in a valley along which many birds fly towards dusk, but is unusual in that whereas some stop to roost there most continue on towards the more central sites. Numbers at roosts should be considered as minimum counts since some birds continue to arrive until it is too dark to see them clearly. Because of this, the highest recorded number shown in Fig. 2 of 15789 birds in January 2015 might imply a total of well over 16 000.



**Figure 2.** Roost counts (combined totals for all roosts) in 2014 and 2015, with data for some months of the two previous years.

### *Nest counts*

Table 1 summarizes the months of peak nest counts each year for all six known nesting colonies in Kampala and Fig. 3 shows monthly counts for four years at the largest colony, Makerere East. Several points are worth noting. First, the Aga Khan School in Old Kampala where nesting trees were cut down but other apparently suitable ones were left, has been abandoned. Secondly, in 2014 and 2015 there was a bimodal pattern to nest numbers which was not seen in 2013 (no counts were made in the middle months of 2012). The bimodal peaks approximate the peaks in rainfall, and to some extent to the pattern recorded by Brown & Britton (1980) who were recording egg-laying dates. Since the total period of nesting, from egg-laying to fledging, is about 55 days (Brown *et al.* 1982), it would be perfectly possible for the same individuals to breed twice a year, although we have no evidence that this is in fact the case. Thirdly, there was a very big increase in the number of nests in November 2015, a particularly wet month (the average rainfall data in Fig. 3 are more than 50 years old, but more limited recent data show a similar pattern). But while rainfall is clearly a factor in determining the timing of nesting, it may not be the only one since there are clear differences in timing between the different colonies, yet presumably they all received similar amounts of rain. Thus peak months for the first nesting period in 2014 varied from April to June, while peaks for the second period ranged from September to December in 2014—but were all around November to December in 2015. Altogether, peak counts in Table 1 occurred among the various sites in every month except March and July. Looking at the nest count data for one of the two largest sites, Makerere East, in more detail (Fig. 3), we see that peak numbers were during May to June in 2014, but around the turn of the year in the other three years. And while the peak in 2013 was below 200 nests, in other years it was above 400.



**Figure 3.** Monthly counts of Cattle Egret nests at the Makerere East site (the largest in Kampala; data are complete from July 2012 onwards), compared to historical data on egg-laying dates from Brown & Britton (1980) for their Region B, which includes southern Uganda, and mean monthly rainfall data for Kampala (from Anon. (1967)).

By 2014, the total numbers of Cattle Egret nests found in Kampala had reached just over 1500, presumably representing some 3000 breeding birds. Similar numbers were recorded in 2015 (Table 1).

**Table 1.** Peak nesting months for first and second nesting periods at the six known nesting colonies in Kampala from 2012 to 2015. A dash (–) indicates no count. See Fig. 2 for more details. Mak = Makerere University; Aga Khan = Aga Khan Schools.

Month of first count	Mak E	Mak W	Bugoloobi	Kabaka's Lake	Mulago	Aga Khan	Totals <sup>b</sup>
	Aug 2012	Jul 2012	Aug 2012 <sup>a</sup>	Oct 2013	Feb 2014	Jul 2012	
2012	Dec 545	Dec 15	Sep 69	–	–	Oct 39	
	Jan <sup>c</sup> 193	Jan <sup>c</sup> 103	Feb 266	–	–	Jan 5	
2013	Dec 165	Dec 5	0	Nov 374	–	0	
	June 524	Apr 96	June 203	May 683	Feb 21	0	1527
2014	Dec 305	Nov 212	Sept 446	Sep 353	Oct 117	0	1433
	June 300	Jan 39	May 458	May 602	Apr 14	0	1413
2015	Nov 452	Dec 272	Aug 295	Nov 397	Nov 81	0	1497

<sup>a</sup>No count from March to June 2013

<sup>b</sup>Only for periods when all colonies were counted

<sup>c</sup>These are presumably from the same breeding period as in December 2012

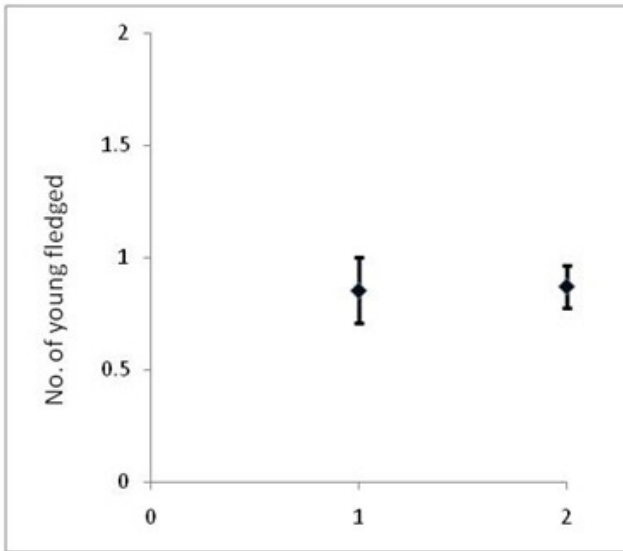
### *Nesting associations*

Throughout Africa, Cattle Egrets often nest with other species in mixed colonies (e.g. Brown *et al.* 1982, Ewbank 2014). The main example of this in Kampala is at Kabaka's Lake, where Little Egrets *Egretta garzetta* and a few Black-headed Herons *Ardea melanocephala*, Sacred Ibis, Open-billed Storks *Anastomus lamelligerus* and Reed Cormorants *Phalacrocorax africanus* share the site, although the ibises nest rather later than the others. In neighbouring Kenya, Cattle Egret nests have been found positioned below those of various species, including Black-headed Heron and Sacred Ibis (D.A. Turner *in litt.*).

At Makerere East all 18 trees used by Cattle Egrets in 2015 were also occupied by nests of the Marabou Stork, although the Marabous, which had over 800 nests altogether on the Makerere campus, also had many trees to themselves. Both species had used most of the same trees in previous years, the egrets nesting lower down than the storks. There were various interactions between Cattle Egrets and other bird species. Cattle Egret nests were occasionally attacked by Marabous, Pied Crows *Corvus albus* and, once, an African Harrier Hawk *Polyboroides typus*, but the Cattle Egrets usually defended their nest contents successfully. At least twice Marabous were observed feeding on young egrets that had apparently fallen from their nests (and were already dead). Both species also fed on insects and other items on the ground below the nests, which became rich in organic refuse.

As mentioned above, all the trees used by Cattle Egrets at Makerere East also contained nests of Marabou Storks, whereas at the National Forest Authority (NFA) grounds at Bugolobi some trees were occupied by both species while others held only

Cattle Egret nests. This provided an opportunity to compare the nesting success of the egrets at the two colonies between trees that were used by both species and those that were not. Since there are many trees at Makerere in which neither species nests, there appears to be no compelling reason for egrets to nest in the same trees as Marabouts. It is possible therefore that sharing nesting trees confers some benefit. But, as can be seen in Fig. 4, the mean number of young egrets fledged per nest was almost identical at the two colonies ( $t=0.058$ ,  $P=0.954$ ), and although the proportion of nests that failed was slightly higher at Makerere, those that did fledge young produced rather more. Thus there appears to be no overall benefit, or disadvantage, in nesting in the same trees as Marabouts.



**Figure 4.** Mean and 95% confidence intervals for numbers of young fledged in the mixed colony at Makerere (1,  $n=34$ ) and from trees with Cattle Egrets only at the NFA (2,  $n=93$ ).

### Urban feeding

Most Ugandan data on Cattle Egret population growth are for the Kampala area where some feed in the city itself, but most of those that roost and nest in the city are thought to fly considerable distances to feed. Elsewhere they are known to travel up to 60 km according to Cramp *et al* (1977). In some parts of their range Cattle Egrets are commensal with large mammals, particularly the larger herbivores, especially grazers (Brown *et al.* 1982, Kioko *et al.* 2016). However, in the Kampala area where cows and other large herbivores are relatively few they search solitarily for bush-crickets, grasshoppers and other large insects on all types of open ground, swamps, shallow waters and also in trees. This last is particularly noticeable when the migratory bush-cricket *Ruspolia differens* (known locally as *nseene*) is present in its millions and many spend the day roosting in trees, forming an easy prey. A particular year-round feeding ground, about 12 km from the city centre, is the main land-fill site at Kiteezi, where up to about 600 can be counted together with Grey Crowned Cranes *Balearica regulorum*, Marabou Storks, Yellow-billed Kites *Milvus migrans parasitus*, Pied Crows and other species.

## Discussion

It is clear that Cattle Egrets are only one of a number of species that have adapted to urban environments in Africa, many of these being large-bodied non-passerines such as Marabou Storks and Black Kites *Milvus migrans* (Ssemmanda & Pomeroy 2010, Chamberlain *et al.* in press), perhaps because they associate such places with reduced risks of predation. Although urban Cattle Egrets are not mentioned by Mackworth-Praed & Grant (1952) it seems likely that they were present in the Kampala area long before the city expanded (which it is still doing). The original natural vegetation of the area included some savanna vegetation on hilltops, where soils are shallow (Langdale-Brown *et al.* 1964), and although cutting down of forests to allow for cultivation had begun about a thousand years ago (Hamilton 1984) the hilltops were less affected. Thus, although not documented (see below), the egrets may have adapted slowly while becoming increasingly confined to those areas that remained open, such as parks. In this way they missed the first stage in urbanization as proposed by Martin *et al.* (2012), namely arrival. Nevertheless, adapting to an urban environment must involve a change in behaviour, something not generally considered in books on bird behaviour (e.g. Stutchbury & Morton 2001).

Feeding by Cattle Egrets in villages is mentioned in *Birds of Africa* (Brown *et al.* 1982), but neither that work nor *Birds of the Western Palearctic* (Cramp 1977) describe urban roosting or nesting by Cattle Egrets, implying that these habits are relatively recent. However, we know that feeding in urban areas is not new (Pomeroy 1975, Dean 1978, and various correspondents – all of these referring to birds feeding on refuse, or fly maggots and other insects).

Urban nesting has been recorded in Madagascar's capital, Antananarivo (Safford & Hawkins 2013) as well as more recently in The Gambia in West Africa and in Nairobi (C. Barlow, D.A. Turner *in litt.*). It is apparent that urban roosting preceded nesting by a number of years in Kampala; both occur in places where many people pass by the trees on which most nests are placed. Although the numbers of Cattle Egrets nesting in Kampala are high for an urban area, the largest recorded count of breeding birds in East Africa was of about 10 000 pairs in the Wembere heronry in Tanzania in the 1960s (D.A. Turner pers. comm., who considers that the total East African population of Cattle Egrets exceeds one million birds).

The highest recorded number of Cattle Egret nests in Kampala was about 1500 in the first half of 2014, but over 13 000 birds were recorded roosting then (including those on nests). Evidently there was a large and unexplained number of non-breeding birds in all years, only some of which are likely to have been immatures (which cannot be easily distinguished when they come into roost at dusk). And whereas Carswell (1986) reported "an increase in most years from September to February" our data for the numbers roosting showed considerable variation between years, but no clear seasonality. In part, this may have been because birds show less fidelity to roosts, and consequently some roosts may have been missed.

A noteworthy feature of the data on numbers of nests is the bimodal seasonal pattern, which implies either that there are two sub-populations or that there is a single population which breeds twice a year, or some combination of the two. Such bimodal patterns of breeding in tropical birds have long been known and are fairly common in East Africa (Brown & Britton 1980) and elsewhere in the tropics (e.g. in the Rufous-collared (Andean) Sparrow *Zonotrichia capensis*, Miller 1962). To clarify the pattern it would be helpful if an opportunity arose to mark some birds. Although



second, and possibly third, broods in Cattle Egrets are known, as are replacement broods (Cramp *et al.* 1977), none of these would produce the bimodal pattern seen in Fig. 3, since the gap between the two modes is about three times as long as a nesting cycle. Considering both Table 1 and Fig. 3 it is clear that peak nesting occurs after the peak in rainfall, when adult grasshoppers may be most abundant, or more easily seen as grasses dry out.

The seasonal abundance of bush-crickets, attracted to Kampala by the bright lights, may have been the original reason for Cattle Egrets coming to Kampala in such large numbers. But when the bush-crickets are not present (which is most of the year) many of the egrets have to fly considerable distances out to their feeding sites. We believe that the more than 15 000 Cattle Egrets in Kampala is the largest urban roost anywhere in Africa, but Kushlan & Hafner (2000) reported a roost of a quarter of a million at Walado Debo in the inland Niger delta in Mali in December 1995. Such high numbers may well be of economic importance given that bush-crickets and grasshoppers are an important part of their diet, and that these insects presumably compete for grass with livestock. Furthermore, grasshoppers may also feed on cereal crops (L. Fishpool pers. comm.). Thus Cattle Egrets can be seen as farmers' friends – an aspect in need of proper study.

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