

## Avian mortality rates on a power line near Kampala, Uganda

Among the most spectacular birds in Uganda is the Marabou Stork *Leptoptilos crumeniferus*, which nests very conspicuously in Kampala, and the Grey Crowned Crane *Balearica regulorum*, the national bird and also globally red-listed by IUCN as Endangered (BirdLife International 2014). These two species frequent the main landfill site for Kampala's garbage, at Kiteezi, some 12 km north of the city centre, as do many other birds, including a number of Hooded Vultures *Necrosyrtes monachus*, also globally Endangered and declining quite rapidly in the Kampala area (Ssemmanda & Pomeroy 2010).

Running close to the Kiteezi dump are two sets of power lines, the 240-kV Bujagali power line carried on tall metal pylons, and a smaller 33-kV line, with three conductors supported on wooden poles, and running about 20 m to the side of and parallel to the high voltage line. For at least twenty years, storks, cranes and vultures have roosted on high voltage pylons in various parts of Kampala, including the Bujagali power line since it was erected in 2011. The cranes also feed in a grassy valley close to the landfill site. Most of the Marabou Storks visiting this area come from the Kampala breeding colony, which contained about 740 nests in the 2013–14 breeding season (DP unpublished data), whereas there are only occasional records of the cranes and vultures nesting in the Kampala area (Carswell *et al.* 2005 and unpublished records). Given (i) the propensity for these birds to roost on utility structures, and to fly regularly in the vicinity of the associated power lines, and (ii) the size and behaviour of the species in question, which probably exposes them to increased risk of colliding with the lines and/or of being electrocuted on live infrastructure (Lehman *et al.* 2005, Jenkins *et al.* 2010), we postulated that the power lines near to the Kiteezi dump site could be a significant source of mortality for these large birds. While there is considerable literature on bird mortality associated with power lines (e.g. Lehman *et al.* 2005, Jenkins *et al.* 2010, Edison Electric Institute 2012), we know of only one such study from East Africa (Smallie & Virani 2010), which reports on potential mortality risk rather than detailing actual deaths.

In order to determine the avian fatality rate on the power lines at Kiteezi, we made walked surveys along the route of the power lines running adjacent to the landfill site over the year from November 2012 to October 2013. Our survey area extended along the route of the two sets of lines, to the east and west of the landfill site, and included the pylons on which cranes and vultures roosted at night (and sometimes rested during the day). There is a 30 m way-leave on either side of the high voltage lines, where people are allowed to cultivate low-growing crops such as maize and beans, and it is easy to walk through this area (there are good footpaths), looking for any dead bird that may have fallen to the ground, and recording details of the identity and location of any likely to have been killed in collision or electrocution incidents; birds previously noted, if still present, were excluded from the count.

A total of ten counts were made (Table 1), each covering a distance of about 6 km, divided into two sections, namely the eastern section, with ten pylons, as far east of the landfill site as the Kampala–Gayaza road at Kyanja, and the western section of nine pylons, extending west to the Kampala–Bombo road. At the same time, local people met along the way were asked for any evidence they had of bird strikes. We also conducted monthly counts of birds at the landfill site, which covers about 15 ha and, with the permission of the local authority, it was simple to walk around the whole area, making a total count (Table 2). This also included those few birds which might be perched on nearby trees or buildings.

**Table 1.** The distribution of dead birds found along the surveyed sections of the Kiteezi power lines 6 km surveyed, and some responses from residents. No other species was found dead.

Date 2012– 2013	Section	Dead birds recorded			Comments by residents of the area
		Marabou Stork	Grey Crowned Crane	Hooded Vulture	
27 Nov	E	1	0	0	All interviewed residents had seen dead birds due to collision or electrocution, strikes are common in big birds
19 Jan	E	3	0	0	Electrocution occasionally happens to Grey Crowned Cranes
16 Mar	E	1	0	0	It is common with Marabous, sometimes birds fight while standing on the electric lines.
30 Mar	W	1	0	0	Both small and big birds die due to electrocution, but Marabous and Grey Crowned Cranes are more vulnerable
18 Apr	E	1	0	0	Birds' death due to electrocution is independent of the size of bird. Activity including mating and fighting on the electric lines makes some birds more vulnerable
27 Apr	W	0	0	0	Few cases are observed where a Marabou survives death after collision. Two residents reported that birds' deaths due to collision are responsible for power shortages in the area, "when a Marabou knocks an electric wire, sometimes power goes off"
20 May	E	3	0	0	Most frequently these accidents happen to Marabous
22 May	W	0	0	0	Deaths occasionally occur
22 Jun	E	1	0	0	Death was caused by "electric collision"
23 Jun	W	0	0	0	Deaths mostly occur to Marabous. Some birds fly away with injuries after the accident
30 Jul	E	4	0	0	Electrocution mostly kills big birds, i.e. Marabous
31 Jul	W	0	0	0	Accidents rarely occur
27 Aug	E	0	0	0	Electrocutions are common during wet seasons
28 Aug	W	0	0	0	Electrocution occurs to big birds like Marabous
25 Sep	E	2	0	0	At times, bats and doves also get electrocuted
25 Sep	W	0	0	0	54 Grey crowned cranes were recorded roosting on the pylons
24 Oct	E	6	0	0	Electrocution happens mostly after rainfall and during evenings
26 Oct	W	0	0	0	59 cranes found roosting on the pylons

**Table 2.** Numbers of large birds frequenting the Kiteezi landfill site during the study period.

Species	Period	Average	Highest	Lowest	Range
Hooded Vulture	Nov–Sep	26	59	9	50
Grey Crowned Crane	Nov–Sep	54	66	37	29
Marabou Stork	Nov–Apr	941	1420	650	770

We recorded a total of 23 bird casualties, all of which were Marabou Storks, which is by far the commonest of the three species, with numbers exceeding ten times those of the other two species combined. They also have the largest wingspan, of 226–263 cm (Pomeroy 1977), compared to about 150 cm for Hooded Vultures (C. Barlow, pers. comm.) and 192 cm for the Grey Crowned Crane (Pomeroy 1980). And cranes are the most agile in flight, often turning sharply as they fly, and might thus be less vulnerable.

All the carcasses were found lying below the main power lines, mostly near but not usually beneath the pylons themselves, and all but one along the eastern section (Table 1). Although we made no observations at night, this would be consistent with collision as the main cause of death, particularly amongst young birds at night, when the conductor wires would have been hard to see. Residents reported that other birds are also killed, mainly large birds, and that these fatalities sometimes led to a cut in the power supply, implying that some birds were electrocuted, but this would appear to have been uncommon.

The present study has identified a clear bird mortality hotspot on the transmission line running adjacent to the Kiteezi landfill site, which is resulting in significant casualty rates for important birds in the area, possibly including globally threatened species, which must be considered to be at risk – cranes were mentioned twice in this connection by local people. We shall recommend to the electricity authority that markers (either static bird flight diverters or dynamic ‘flappers’) be placed along the power lines for at least 2–3 km east of the Kiteezi landfill site, and that bird guards are installed at offending pylons to deter birds from perching in high risk areas, close to live hardware on the pylons. Provided that they are clearly seen at night, these markers should ensure that both avian mortality rates, and the frequency of costly power outages, are substantially reduced.

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**Micheal Kibuule and Derek Pomeroy**

*Department of Environmental Management, Makerere University, P.O. Box 7298, Kampala, Uganda.  
Email: derek@imul.com*

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