TERMINAL VELOCITY

End of the line for Ludwig's Bustard?

TEXT BY ANDREW JENKINS & JON SMALLIE
Wildlife & Energy Interaction Group, Endangered Wildlife Trust

CHRIS VAN ROOYEN

Africa is the global centre of bustard diversity, and the southern portion of the continent supports no fewer than 11 of the world's 25 species, including six endemics. If you're a bustard enthusiast, southern Africa is definitely the place to be. But, unfortunately, very few people *are* passionate about them and the region's unique bustard fauna is distinctly under-appreciated. Somehow, they just don't match the style and elegance of other groups of birds, such as the similar, but much-celebrated cranes.

Worryingly, and perhaps because they lack that vital glamour factor, there is at present no orchestrated research or conservation effort under way to improve the understanding of southern Africa's bustards, despite the fact that six of the species are already considered Threatened. Even more alarming is that the largest of the endemic species, Ludwig's Bustard, is dying in great numbers as a result of man's developments in its Karoo homeland. It could be facing imminent extinction, yet, to date, remedial efforts do not appear sufficient to avert this potential tragedy.

COLLISION COURSE

Ludwig's Bustard *Neotis ludwigii* is a Karoo species, preferring open, plains country, where it can wander around, picking insects, small reptiles and bits of vegetation from the stony ground. It typically occurs in loose flocks, aggregating to roost on hilltops overnight, and moving haphazardly with the seasons, following the plentiful aftermath of rain in this semi-desert environment.

There are probably fewer than 80 000 of these rather ponderous, seemingly absent-minded nomads left in the world, all contained within an area of less than 400 000 square kilometres. While their Karoo habitat has generally been spared the ravages of industrial and agricultural development, and is big and sparse enough to absorb most of what has come its way to date, it accommodates thousands of kilometres of overhead power and telephone lines. The South African national power grid comprises a backbone of massive, high-voltage lines, branching into a complex grid of smaller, lower voltage distribution and reticulation lines, and is crucial to sustaining the country's economic growth. Unfortunately, it is also a lethal trap for bustards.

Biologists and power utilities around the world have known for decades that power lines can be hazardous for birds, and that many species suffer significant casualties in collisions with high-tension wires and cables. Such collisions seem to occur particularly in situations where the height, configuration and situation of the lines, which affect their visibility and the extent to which they impinge on popular flight paths of birds, all conspire against the prevailing avian traffic. Also, certain types of birds (notably bustards, cranes, storks, raptors, waterfowl and gamebirds) are more susceptible to hitting power lines. Topping the list are large, heavy-bodied, terrestrial species, probably because they often fly cross-country at fairly low altitudes, within the elevation ranges of even the smaller lines, and because they are relatively clumsy fliers, with a lot of forward momentum and not much manoeuvrability.

Aerial agility is largely a function of wing loading (the ratio of body weight to wing surface area), and chunky-bodied birds with small wings are often not sufficiently dexterous to avoid obstacles at short notice. The biggest bustards take this equation to its extreme: Kori *Ardeotis kori* and Great *Otis tarda* bustards are among the world's heaviest flying birds and, although they do regularly collide with overhead lines, they may be saved to some extent by their predominantly terrestrial existence and their general reluctance to fly. Ludwig's Bustard, on the other hand, while also a big, heavy bird, is slightly lighter on the wing and is far more mobile than the Kori. However, while this means it is more likely to encounter power lines while flying, it is still almost incapable of making the rapid changes of direction needed to avoid fatal collisions. These qualities are compounded by the Ludwig's tendency to fly in flocks, which introduces the possibility of multiple casualties in single-collision incidents, and its propensity for flying to and from roosts in the dim light of dusk and dawn, when conditions for seeing power lines are arguably at their worst.

In grassland habitats, the very similar Denham's Bustard *N. denhami* replaces Ludwig's, but is more widely distributed and far less inclined to long-distance movements, so it is probably not as collision-prone. All things considered, Ludwig's Bustard may have the worst avian collision risk profile on record.

MARK D. ANDERSON (2)

THE SCALE OF THE PROBLEM

For more than 12 years, the Endangered Wildlife Trust (EWT) has worked in partnership with the South African power utility, Eskom, to collate, monitor and mitigate wildlife mortalities on existing power lines, and to ensure that all new infrastructure built is as 'bird-friendly' as possible. All recorded and reported incidents are added to the Partnership's Central Incident Register (CIR) for evaluation and feedback on possible required management and mitigation. To date, the CIR holds about 3 000 mortality records, of which just less than 10 per cent are Ludwig's Bustard collisions. This figure is in itself a concern, given that only a fraction of all collision victims are actually picked up and reported.

But, when examined more closely, the true gravity of the Ludwig's Bustard's situation becomes apparent. In the only properly quantified study of avian collision rates on South African power lines, conducted in the eastern Karoo in the late 1990s (and funded by Eskom), Mark Anderson recorded about two Ludwig's Bustard collisions per kilometre of high-voltage line per year. More recently, repeat surveys of one of Anderson's focal lines by Ronelle Visagie and Bradley Gibbons of the EWT are producing equally concerning results. Although Eskom has invested a huge amount of resources into the development and implementation of mitigation measures at these and other collision sites, the ongoing mortalities are cause for concern and point to the need to increase our response drastically.

Anderson's was also the only significant local attempt to test the efficiency of various marking devices being used to make power lines more obvious to birds (and hence lower the likelihood of collisions). The markers are generally either static coils of wire (bird-flight diverters, also known as 'pigtails'), or teardrop shapes suspended loosely from the line and able to flap about in the wind (bird-flappers). Both of these devices are positioned at intervals along problem sections of line, usually on the higher, thinner earth-wire, which poses the greatest threat to overflying birds. The Karoo study showed that while both markers available at that time were reasonably effective in reducing Blue Crane collisions, they had no noticeable effect on Ludwig's Bustard casualties. Subsequent to this study, several new variations on these markers have been developed by Eskom and its suppliers, and anecdotal evidence of some success in reducing bustard collisions at certain sites has emerged. However, it is clear ▷

KOOS DE GOEDE

Above *Occasionally, the mechanics of a bird/power-line collision are such that the victim dies hanging from the line. Typically, this Ludwig's Bustard struck the higher, thinner earth-wire of a major transmission line, and paid the ultimate price.*

Opposite *The massive, high-tension power lines that traverse the Karoo are crucial infrastructural links, carrying power from source to user. Unfortunately, they are also deathtraps for large terrestrial birds.*

Opposite, inset *Eskom has fitted static 'bird-flight diverters' (pigtails) or dynamic 'bird-flappers' to problem lines in many areas in an effort to reduce the frequency of bird collisions.*

Previous spread *All power and forward momentum, a Ludwig's Bustard takes to the air. Built for carrying its considerable bulk over the vastness of the open Karoo, the bustard's airframe is ill-equipped for rapid evasive manoeuvres. Collisions with aerial obstacles seem almost inevitable.*

CHRIS VAN ROOYEN

Ludwig's Bustard may be more collision-prone than other large bustards because of its greater tendency to fly. Researchers need to know far more about where, when and why individuals undertake their movements, so that an effective strategy to reduce bustard deaths on power lines can be developed. Satellite telemetry may hold the key.

that we do not yet have an adequate solution, despite already using the state-of-the-art devices available globally.

While the bustard death rates recorded near De Aar may represent extreme collision 'hotspots' and the overall average may be considerably lower, with more than 16 000 kilometres of medium-high voltage power line in the Karoo and even more low-voltage and telephone lines, the total Ludwig's Bustard casualty count every year could be huge. We don't have sufficient accurate life-history information to assess fully the impact of such heavy losses on the population as a whole, but we probably do know enough about large, long-lived and slow-reproducing birds to be sure that unnatural mortality rates of as much as 10 to 20 per cent per annum cannot be sustainable. Without the benefit of rapid and effective intervention, future prospects for Ludwig's Bustard look extremely grim.

WHAT CAN BE DONE?

This was the question asked in March 2008 at a birds-and-power-lines research strategy workshop hosted by the EWT's Wildlife and Energy Interaction Group (which incorporates the Eskom-EWT Strategic Partnership), and attended by a panel of local crane, bustard and raptor biologists. What could accurately be called the 'bustard crisis' emerged clearly as the most pressing issue on the workshop's agenda, and a wishlist of bustard research was drawn up, focused on finding a way to reduce collision frequency. Top of the list was the need to update and refine our estimate of the size of the Ludwig's Bustard population, and to compare this estimate with the figure calculated by David Allan more than 15 years ago.

This should give us an idea of the extent of any decline in numbers, and the time we still have available to stem the tide. We also identified the need to start measuring bustard collision rates across the whole range of Karoo habitats (rather than continuing to base our approach on data gathered from a single site). In addition, we need to improve our knowledge of Ludwig's Bustard movements, so that any pattern or predictable scenario in relation to the national power grid can be used to enhance whatever collision-mitigation plan we devise. Finally, we realised the need to deepen our understanding of exactly how bustards perceive power lines, why they collide with them, and how to make the lines more obvious to flying birds.

The first couple of our objectives should be relatively straightforward; some of the bustard population data may already be available, and we have begun setting up strategically positioned study sites to monitor collision rates. Our other research goals are rather more challenging. The only way to fully get to grips with Ludwig's Bustard movement patterns, and to measure the frequency with which they cross and re-cross power lines in the course of their daily, seasonal and annual journeys, is to fit a sizeable number of birds with satellite-tracking devices. More and more of this type of work is being done on birds worldwide and, while it is expensive and has a number of practical drawbacks and limitations, it is unsurpassed in terms of the quality and quantity of spatial information it delivers. If we can raise the funds for it, and manage to catch some bustards to fit with trackers (quite possibly much easier said than done!), we will definitely follow the satellite-telemetry route.

The visual perception issue is a fascinating one, and may well prove critical to our success. We hope to recruit the assistance of Professor Graham Martin from the University of Birmingham in the UK to tackle this highly specialised aspect of the study. Martin is an expert on avian eyesight and is well known for the unique approach and apparatus he uses to measure birds' visual fields, determining what they can and cannot see in a range of circumstances. Already, in our initial correspondence with him, we have noticed some of the incredible nuances of this kind of work. With his help, we hope to figure out why bustards on the wing apparently fail to see power lines in time to avoid them, why diverters and flappers seem to be ineffective in mitigating bustard collision risk, and what other means we should employ to better draw the bustards' attention to the hazards ahead of them.

A TEAM EFFORT

Charisma issues notwithstanding, it's high time Ludwig's Bustard received the attention it so urgently requires. Covering the research ground described above and devising and executing the resulting conservation plan will take a concerted team effort. To its credit, Eskom has already expressed its continued commitment to this cause, and we at the Wildlife & Energy Interaction Group will do all we can to facilitate the process, second the relevant expertise and bring the required person-power needed to get the job done. Here's hoping that the bustards can persist in the interim. □

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enigmatic wanderer

Ludwig's is the third-largest bustard in southern Africa, with males weighing up to six kilograms. The species is named after a Cape Town pharmacist, German-born Baron von Ludwig, who was an active amateur naturalist in the region in the early 1800s. Despite its size and relative conspicuousness on the open plains of the Karoo, Ludwig's Bustard is remarkably little known, and critical areas of its life, in particular the details of its seasonal movements, remain frustratingly mysterious.

We know that it is a semi-desert specialist that generally occurs in small groups, walking and feeding together on insects, fruits and leaves in roughly the same area. These small bands collect to form larger gatherings at designated, hill-top roost sites. We also know that Ludwig's, like most bustard species, is a polygynous breeder, with the adult males, which are far larger than the females, going it alone every breeding season at carefully selected display sites scattered across the landscape. They puff themselves up into giant, white-feathered balls, and boom out their throaty love songs to prospective mates. After mating, these avian Barry Whites turn to their next possible conquests, crooning away at the horizon, and leaving the female to complete the cycle of egg-laying (usually 2–3 eggs in a clutch), incubation and rearing of young (usually 1–2 young in a brood) on her own.

We have some understanding of Ludwig's Bustard's nomadic nature, its apparent dependence on rainfall patterns across the Karoo, and its tendency to move west in winter and east in summer. However, given the dual threats of power-line mortality and climate change, we don't know nearly enough about what drives these movements, how predictable they are, how frequently and where they bring bustards into conflict with the national power grid, and how movement patterns may fluctuate in rhythm and extent with anticipated changes in the Karoo weather. There is plenty of hard work to be done.