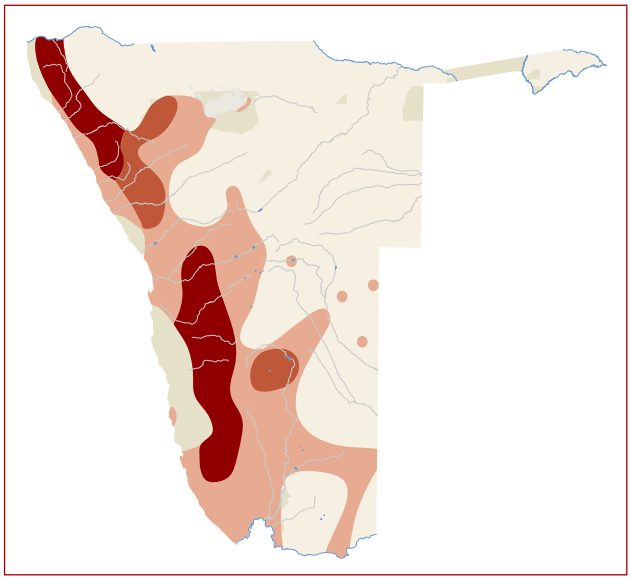
LUDWIG'S BUSTARD | *Neotis ludwigii*

HA Scott; JM Shaw; JR Pallett | *Reviewed by: DG Allan; PG Ryan*



Conservation Status:	Endangered
Southern African Range:	Namibia, southern Botswana, South Africa
Area of Occupancy:	342,000 km^2
Population Estimate:	56,000 to 81,000 birds in Namibia and South Africa in the late 1980s
Population Trend:	Uncertain, probably declining
Habitat:	Semi-arid dwarf shrublands of succulent Karoo, Nama Karoo and Namib, with rainfall less than 500 mm
Threats:	Collisions with overhead lines, fences and wind farms, (illegal) hunting, disturbance

DISTRIBUTION AND ABUNDANCE

The Ludwig's Bustard is near-endemic to southern Africa, with a range centred on the dry biomes of the Karoo and Namib. It is found predominantly in western Namibia and in much of western and south-central South Africa and extends in the extreme south-west of Angola and the southern tip of Botswana (Allan 1997m, 2005d, Anderson 2000f, Dean 2000). In Namibia's protected areas, it occurs in the Skeleton Coast Park (Ryan *et al*. 1984), the Namib-Naukluft (Boyer & Bridgeford 1988), Etosha and Tsau//Khaeb (Sperrgebiet) national parks, as well as the (private) NamibRand Nature Reserve.

This bustard is sparse to locally common (Allan 2005d). It is a nomad and partial migrant (Allan 2005d), with regular east-west movements recorded in South Africa, linked to seasonal rainfall (J Shaw unpubl. data); numbers in the Free State, South Africa increase after rain and associated locust irruptions (Herholdt 1988). In Namibia, it is most common in the Namib Desert (west) in winter (May to October), and on the escarpment (east) in summer (November to April: Allan 1994a). There is a significant correlation between bird density and rainfall in the previous three months (Allan 1994a); following good rainfall, numbers increased in the Namib-Naukluft Mountains (Boyer & Bridgeford 1988) and Sperrgebiet area (Ryan *et al*. 1996). It migrates into the winter-rainfall succulent Karoo during winter and spring, but there is no evidence for seasonal changes in abundance in the summer-rainfall Nama Karoo, possibly linked to lower detection rates when grass is tall in summer in the Nama Karoo (Allan 1994a).

In the late 1980s, the global population was estimated at 56,000 to 81,000 individuals (Allan 1994a) and the species is suspected to have declined rapidly since then as a result of frequent collisions with power lines, telephone lines and fences (Anderson 2002, Jenkins & Smallie 2009). In the succulent Karoo biome, densities of 3.8 to 48 birds per 100 km^2 were recorded during winter (Allan 1994a). Densities of eight to 13 birds per 100 km^2 were estimated during annual game counts in winter in 2011 and 2010 respectively in the NamibRand Nature Reserve (Scott 2011a).

ECOLOGY

The Ludwig's Bustard occurs in areas receiving less than 500 mm rainfall, including open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes (Herholdt 1988, Allan 1994a). It is typically found on flat terrain (Allan 2005d). In the Namib-Naukluft National Park, 65% of birds occurred on sandy plains, 20% on rocky plains and 15% on gravel plains (Bridgeford 1988). Within the Karoo in South Africa, it often forages in fields and irrigated lands. It occurs singly and in groups. Group size averaged between 2.5 and 3.6 in the 1980s (Mostert 1982, Bridgeford 1988, Allan 2005d), but large flocks of up to 105 individuals have been recorded (Bridgeford 1988). Large groups are not considered socially cohesive units, but are loose aggregations at concentrated resources such as locust outbreaks (Allan 2005d). It typically roosts communally on raised, open ground and coastal dunes (Ryan 1998a, Allan 2005d), is extremely wary and flushes easily (J Shaw pers. obs.), taking off clumsily and flying low when startled (HA Scott pers. obs.). It is capable of strong, sustained flight when it is highly conspicuous (Allan 2005d).

The Ludwig' Bustard is sexually dimorphic, with males weighing 3.1 to 6.0 kg and females 2.2 to 3.0 kg, and a population sex ratio of one male to four females (Allan 2005d). It is polygynous, with dispersed leks; evidence for monogamy is lacking, despite reports of 'pairs' (Clancey 1972, Anderson 2000f). It is a solitary nester (Tarboton 2001). Males display at regularly used sites (Allan 2004), some of which have been used for more than 25 years (Collett 1982). Eggs are laid on bare ground in a shallow scrape, with a clutch of one to three eggs (usually two, rarely three). Laying dates vary throughout its range. In Namibia, eggs are laid throughout most of the year, with a peak between March and May (n=20); nest records from South Africa indicate laying dates between September and February (n=24) in the eastern and southern Nama Karoo, in March (n=1) and between July to September (n=3) in Bushmanland, and between July and September (n=14) in the succulent Karoo (Hoesch & Niethammer 1940, Collett 1982, Brooke 1984, Boyer & Bridgeford 1988, Herholdt 1988, Lawson 1993, Martin & Hahndiek 1996, Jarvis *et al*. 2001, Allan 2005d, Brown *et al*. 2015, Nest Record Card Scheme, Northern Flagship Institution unpubl. data). Chick-rearing is conducted solely by females (Allan 2005d). Hatching success is apparently low and it often deserts the nest if disturbed by humans (Allan 2005d).

It forages by walking slowly and pecking close to the ground, and by darting after large insects (Mostert 1982, Allan 2005d). The diet includes arthropods (grasshoppers, locusts, beetles, weevils, caterpillars, ants, mantids, termites, flies, bugs (Heteroptera), centipedes, spiders and scorpions), small vertebrates (reptiles and rodents) and vegetable matter, including leaves, seeds and berries of Wolwedoring *Lycium oxycladum* (Sclater 1906, Horsbrugh 1912, Bridgeford 1988, Allan 2005d, WRJ Dean unpubl. data). There is strong evidence that the species undergoes movement with rains in pursuit of Orthoptera hatchlings, though vegetation in the diet remains important (Allen 1994a). Birds on the ground spend 85% of the time walking (Allan 2005d). They seldom drink (Allan 2005d), although regular (seasonal) drinking behaviour has been observed at waterholes in NamibRand Nature Reserve in Namibia; in August 2010 a group of 12 individuals was observed at a waterhole, of which six were juveniles or subadults (HA Scott pers. obs.).

THREATS

In South Africa, collision with overhead wires associated with power infrastructure constitutes the major threat (Herholdt 1988, del Hoyo *et al.* 1996, Anderson 2002, Allan 2005d, Jenkins & Smallie 2009, Jenkins *et al.* 2011). In the eastern Karoo, about 270 carcasses were found underneath 150 km of high voltage power lines; thin earth lines above large power lines are regarded as the most perilous feature (Anderson 2000f). Collision rates on overhead lines in this area may exceed one Ludwig's Bustard per km per year (Anderson 2002, Jenkins & Smallie 2009). A recent survey found preliminary evidence for this level of mortality on power lines across the Karoo, indicating that the problem is widespread (Jenkins *et al.* 2011). An average of at least 0.63±0.12 fatal collisions per km of power line per year has been estimated, with relatively little regional variation in collision rate (Jenkins *et al.* 2011). This suggests that between 4,000 and 11,000 birds may be killed per year on high-voltage power lines across the Ludwig's Bustard's range (Jenkins *et al*. 2011). However, actual power line collision mortality is probably much greater because this estimate does not include mortalities on other types of overhead lines, such as lower voltage power lines and telephone wires, and because of biases in carcass detection, including scavenging and habitat biases and injured birds dying away from power lines (Jenkins *et al*. 2011). Collision is male-biased,

comprising 61% of recovered carcasses, perhaps because males are larger and less manoeuverable in the air (Jenkins *et al*. 2011). Low voltage lines also pose a threat, and were found to kill 0.45 Ludwig's Bustards per km per year (adjusted for survey biases) near Calvinia, South Africa (Schutgens 2012). In Namibia, at least 80 Ludwig's Bustard mortalities, or 36% of all bird mortalities, were recorded near power lines randomly surveyed from 2006 to 2012 (http://www.the-eis.com 2012); these included 24 mortalities recorded during a survey of a 66 kV power line in the Sperrgebiet area in September 2011 over a distance of 36 km, or 0.67 birds per km of power line (HA Scott, RM Scott unpubl. data).

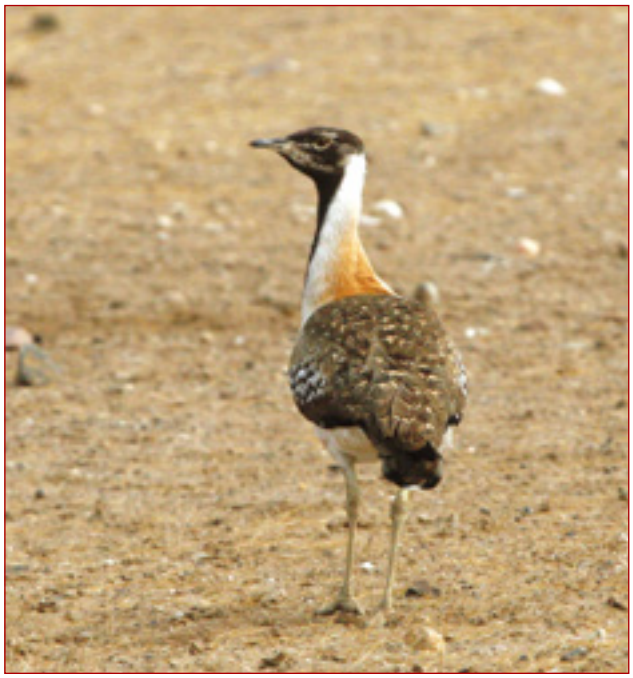
The extent of power lines across the range of Ludwig's Bustard is vast and expanding (Jenkins & Smallie 2009). Considering the high mortality rates due to collisions and the Ludwig's Bustard's relatively small global population, it is anticipated that collisions alone will cause a rapid decline in the population in future (Jenkins *et al.* 2011). Devices to mark power lines, for example bird flappers and bird flight diverters, are traditionally used to reduce bird collisions, but substantial doubts remain regarding the best marking device, because efficiency may vary with local conditions and the species involved in each instance (Jenkins *et al*. 2010). There is limited evidence to suggest that line marking may not be effective in reducing bustard collisions (Anderson 2002). Martin & Shaw (2010) demonstrated that bustards have restricted forward vision, which may explain their high susceptibility to collisions, and the apparent lack of effectiveness of marking.

Other threats to Ludwig's Bustards in South Africa include accidental trapping or poisoning in mammal control operations on farms, an unknown level of deliberate hunting, collisions with other structures such as telephone lines, fences and emerging wind farms, and disturbance (del Hoyo *et al.* 1996, Allan & Anderson 2010, IUCN 2012a).

CONSERVATION STATUS

The Ludwig's Bustard was uplisted from globally *Least Concern* to *Endangered* in 2010 (IUCN 2012a), after recent research suggested that the population has undergone a very rapid decline due to collisions with power lines, a trend that is set to continue as successful mitigation measures are yet to be designed and implemented. In South Africa, it was recently elevated from *Vulnerable* to *Endangered* (Taylor *et al*. in press) because of its restricted range, slow breeding rate and probable population decline as a result of power line collisions (Anderson 2000f).

In Namibia, a status of *Endangered* is recommended, on the basis of its global conservation status, the comparatively better researched situation of the Ludwig's Bustard in South Africa and the limited data from power line surveys available in Namibia. This categorisation requires confirmation, pending the results of current initiatives to assess local population size and trends and to estimate power line mortality rates in Namibia. It should be given *Specially Protected* status under any revised or future Parks and Wildlife legislation.



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ACTIONS

To date, mitigation measures for power line collisions, consisting of visual line markers, have been implemented on a very small percentage of lines in South Africa by national power utility, Eskom, but have not yet proved to work effectively (Anderson 2002). Research is thus urgently required to identify ways to mitigate collisions with power lines effectively (BirdLife International 2010). In addition, it is crucial that the current population size and recent population trends are assessed. Conservation measures currently underway in South Africa include obtaining an updated population estimate; measuring bustard collision rates across the whole range of Karoo habitats; and improving knowledge of annual movements (Jenkins & Smallie 2009; BirdLife South Africa's Bustard Working Group In Namibia, the NamPower/NNF Strategic Partnership was initiated in 2008 in order to address interactions between wildlife and power lines (Scott *et al*. 2012; newsletters of the Partnership: http://www.nnf.org.na/project/nampowernnf-partnership/13/5/5.html
A research project was initiated in 2012 to investigate collisions of large birds, especially bustards, with power lines in Namibia, and to determine their significance and possible solutions.