Blade runner: Jackal Buzzard *Buteo rufofuscus* and other birds in a wind farm environment in South Africa

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Introduction

As the green energy industry gears up in South Africa, environmentalists hold their collective breath as to the impacts that wind farms and solar arrays may have on the environment. At present we can only gauge these from overseas studies where some bad mistakes - and many success stories - are emerging from an increasing number of long-term bird impact studies. The bald facts are that on average an estimated 2.3 birds are killed per year for every turbine in the USA outside California (The National Wind Co-ordinating Committee, 2004). However, this ranges from as low as 0.63 birds per turbine per year in Oregon to 10 birds per turbine per year in Tennessee, illustrating the wide variation in mortality rates between sites. The reason California is singled out is because of the notorious Altamont Pass Wind Farm where over 5,000 turbines were placed in the path of migrating birds, especially raptors, and kills almost 3,000 birds per year including over 1,000 raptors of which more than 60 are Golden Eagles *Aquila chrysaetos* (Smallwood and Thelander, 2008). In Spain at Tarifa and Navarre, in the Straits of Gibraltar, large numbers of migrant raptors are also killed and both have become infamous for the mortality they cause. More recent studies on the island of Smøla in the Norwegian archipelago indicate that breeding White-tailed Eagles *Haliaetus albicilla* have been badly affected ; the original thirteen pairs have been reduced to five pairs and they are still in decline (Nygard et al., 2010). As worrying was the finding that some eagles were using the turbines to gain lift on low-wind days. All these studies indicate that wind farms must be carefully surveyed for migrant, nomadic and large terrestrial and soaring birds so that turbines are not positioned where they will impact such collision-prone species.

For South Africa, or anywhere in Africa, we do not know what the effects will

be because there are no published studies on the effects of turbines on birds, bats or any biodiversity. An unpublished study by Jacque Küyler reports from an 8-month monitoring period that five bird carcasses were found below the three turbines at Klipheuwel. No formal bird monitoring occurs at the other wind farm at Darling, so we set out to rectify that and provide some of the first observations.

There are currently only two operating wind farms in South Africa and the best known of these is the Darling Wind Farm, with four turbines, visible from the west coast road about 2 h north of Cape Town (Figure 1 a-d). However, there are plans for many more wind farms on the windy west coast as detailed by the wind-energy industry, stretching from Darling to Alexander Bay in the north and east into the Eastern Cape (www.sawea.org.za). Many are planned for the Karoo with some huge projects entailing more than 500 turbines. Each turbine provides up to 1-3 megawatts of electricity, so these farms have the potential to add significantly, day and night, to the increasing demands of an energy-hungry South Africa.

Potential impacts are being studied by individual consultant biologists, with a focus on birds, bats and plants. These individual, site-by-site approaches, are cause for concern so the Endangered Wildlife Trust and Birdlife South Africa have come together to form an alliance (BAWESG: Birds And Wind Energy Specialist Group) that will help direct a strategy that will inform the wind industry (Jenkins et al., 2011). With this recently formed body decision makers can consolidate their expertise so that South Africa can avoid the same mistakes that California, Spain and Norway made in their early days of wind farm placement.

Methods

We spent just over eight and half hours on three different days at the Darling wind farm (33°18’57.1”S, 18º15’43.7”E) and at an adjacent site hill top site at Khwa-ttu Bushman restaurant (33°20’54.7”S, 18º16’07.4”E), as a control, in spring and early-summer 2010 monitoring the bird life passing around the turbines. We concentrated on larger birds that are seen as collision-prone, although smaller birds (and bats) may be just as likely to collide with the turbines and are more likely to be overlooked.

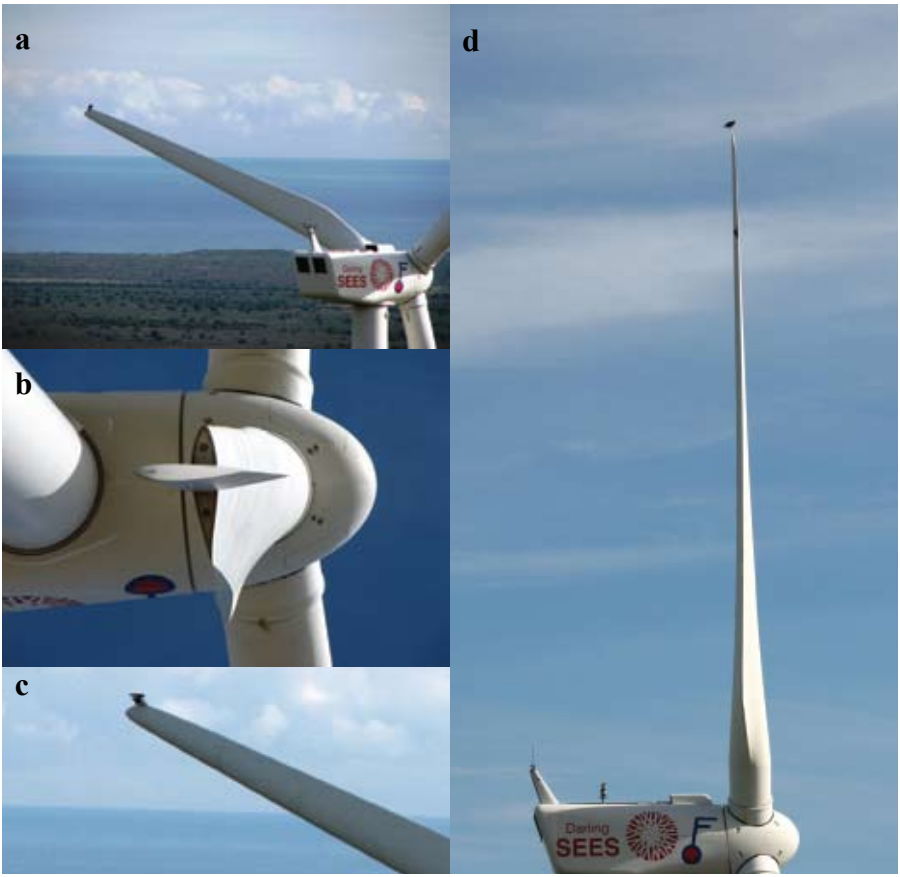

Figure 1. a) A Jackal Buzzard perches on the stationary blades of the turbine at the Darling Wind Farm, South Africa, b) an end-on-view of the turbine blade and its "paddle" that acts as an air brake to stop the turbine rotating when winds become too strong. It is this section that is used by the perching Jackal Buzzards, c) a pair of Jackal Buzzards come to grips with their new environment and enjoy the benefits of a lofty perch to perpetuate their genes, d) a Jackal Buzzard perches on top of an upright turbine blade at Darling Wind Farm, at a combined height of 81 m above the ground.

The hub height of the four turbines at Darling Wind Farm is 50 m with 31 m turbine blades (Figure 1 a-d). Thus species flying at a height between 19 m and 81 m in the area are at risk from collision.

Results: Field observations

A total of 40 birds of 11 species were recorded in 3 hours at the possible wind farm site (contol site) at *Khwa-ttu*, of which three are IUCN red-listed species and three are endemic to southern Africa (Table 1).

Table 1. Birds recorded at a potential wind farm site from 13h30-16h30 (3 hours) on 9 September 2010 at the *Khwa-ttu* Bushman restaurant site. Height (m) indicates height above ground at which birds were recorded.

Species	Abundance	Height (m)	Conservation Status
Pied Crow *Corvus albus*	11	30-100	Common resident
Sacred Ibis *Threskiornis aethiopicus*	2	50	Common resident
Cape Cormorant *Phalacrocorax capensis*	1	10-50	**Common near-endemic, near-threatened**
White-throated Swallow *Hirundo albigularis*	6	15-30	Fairly common breeding migrant
Yellow Billed Kite *Milvus aegyptius*	5	50- 100	Breeding migrant
Cape Turtle Dove *Streptopelia capicola*	1	15-30	Very common
Martial Eagle *Polemaetus bellicosus*	1	200-300	**Vulnerable**
Black Shouldered Kite *Elanus caeruleus*	1	50-100	Common resident
Black Harrier *Circus maurus*	1	1- 40	**Endemic, near-threatened**
Rock Kestrel *Falco rupicolus*	1	50-100	Common resident
Cattle Egret *Bubulcus ibis*	10	30-50	Uncommon to locally common resident
Totals: **11 species**	**40**		**3 Red-listed species indicated in bold**

A larger number of birds were seen at the operational wind farm site at Darling (Table 2): a total of 106 birds of 14 species were observed in a little over 5.5 h. These also included three red-listed species for a total of four red-listed species for the two sites. A total of 86 birds (excluding the European Bee-eaters >250 m away) were observed in 8.58 hours at the two sites.

Two Martial Eagles *Polemaetus bellicosus* were seen flying together between

70 and 400 meters above ground level and in close proximity to the wind turbines. The Great White Pelicans *Pelecanus onocrotalus* (a flock of 2 at 11h08 and 8 at 11h51) all gained height in the thermals over the Darling hills. They then flew directly over all four turbines (~50-60m above the highest arc of the blade) towards the coast, probably on their way to Dassen Island where they breed. At 11h39 a Black Harrier twice flew below the most easterly turbine (Figure 2). It appeared to be oblivious of the presence of the turbines while it was hunting. A flock of Cattle Egrets *Bubulcus ibis* flew between two of the turbines at approximately 10-30 m above ground level.

Table 2. Birds recorded at the operational Darling wind farm on 10 September 2010 (09h45-13h00) and 22 September (15h00-17h20). Height (m) indicates height above ground at which birds were recorded.

Species	Abundance	Height (m)	Conservation Status
Pied Crow *Corvus albus*	4	30-100	Common resident
Martial Eagle *Polemaetus bellicosus*	2	70- 400	**Vulnerable**
Sacred Ibis *Threskiornis aethiopicus*	2	20-80	Common resident
Cape Spurfowl *Pternistis capensis*	3	0-10	Endemic, common
Jackal Buzzard *Buteo rufofuscus*	2	<300	Endemic, common
Great White Pelican *Pelecanus onocrotalus*	10	100- 200	**Locally common, near-threatened**
Kelp Gull *Larus dominicanus*	2	20-80	Common resident
Rock Kestrel *Falco rupicolus*	1	100-200	Common resident
Lanner Falcon *Falco biarmicus*	1	100-150	Uncommon resident
Black Harrier *Circus maurus*	1	1-10	**Endemic, near-threatened**
Yellow Billed Kite *Milvus aegyptius*	1	20- 100	Breeding migrant
Cattle Egret *Bubulcus ibis*	15	10-30	Locally common resident
European Bee-eater*	60	10	Uncommon to locally common migrant
Helmeted Guineafowl	2	0-5	Common resident
Totals: 14 species	**106 birds**		**3 Red-listed species indicated in bold**

*excluded from the passage rate calculations as they did not pass nearer than 200 m from the turbines.

Figure 2. A foraging Black Harrier photographed passing just below the most easterly turbine at the Darling wind farm.

Unusual observations of Jackal Buzzards

A pair of Jackal Buzzards *Buteo rufofuscus* were seen on our first days of observation in September 2010 using the novel stationary perch sites for high altitude surveillance. Judging by the small mammal burrows beneath the towers, they were hunting rather than simply perching and also appeared to be preparing for breeding.

On two occasions in the first 2.3 hours of observation the buzzard pair copulated on what appeared to be a precarious perch, making it easy to observe. However, there was no subsequent evidence of nest building or breeding in the short time we were there. A lattice tower close to the turbines is one likely nest site and was used for perching by the buzzard pair during our observations. Clearly these particular buzzards have taken to their new environment but they may be dicing with fate on the windy days if they use the rotor housing (nacelle) for their high level foraging or nesting.

Discussion

In the short total time we observed birds at or near the Darling wind farm we observed a steady stream of 86 birds in 8.58 h passing at a rate of 10.0 birds per hour. This is about twice that recorded by Andrew Jenkins (5.5 birds/h) in 86 h work at the same facility in 2002-2003 (Jenkins, unpubl. data). Bird species included some collision-prone and threatened species such as Martial Eagle, Black Harrier *Circus maurus* and White Pelican. Other larger species included African Sacred Ibis, egrets, cormorants, crows and Yellow-billed Kite, to name a few. None hit the turbines, despite a very close call by one of the ibises that took rapid evasive action metres from one turbine blade almost causing it to collide with the adjoining blades. The resident engineer, Mr Mostert, reported that he had seen no bird fatalities on his daily rounds since 2006. However, no formal studies have been undertaken and this remains an oversight. This short set of observations constitutes the first published study of passage rates and species possibly at risk to wind turbines in South Africa.

On the last of our three days there, the turbines were being tested and braked using the small paddles at the end of the 31 m blades. The noise at these times is substantial and the "whoomp-whoomp" of normal turbine movement through the air may well alert birds to an altered environment ahead. Some particularly collision-prone species such as bustards and cranes do not see "silent" powerlines ahead because of a "blind spot" in their visual fields (Martin and Shaw, 2010) and significant mortality is recorded in South Africa (Shaw et al., 2011). This finding makes evolutionary sense given that bustards and cranes probably evolved in a two-dimensional environment and only need to look down for food and up and laterally for predators, and have no need to view the path ahead – until now.

As more studies take place we can determine more accurately the rate of bird fatalities and assess how different species react to stationary and spinning blades. Such data will also allow us to discover if rarer species forage close to operational and planned facilities, and to determine if there is any avoidance behaviour as recorded in studies overseas (Walker et al., 2005). This study occurred during early-spring before the influx of migrant Steppe Buzzards *Buteo vulpinus*. Therefore, time of the year together with migration corridors and flight height during migrations are important factors to consider in future South African studies.

Based on our very short study of just four turbines we conclude that many birds are using the airspace around the turbines at Darling but the level of mortality, if any, is presently unknown. That four of the recorded species are red-listed is cause for concern. A concerted effort should be made to collate all on-going studies of pre-construction monitoring of birds at wind farm developments in southern Africa to determine which species are likely to be influenced negatively once the wind farms are erected.

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