

Collision vulnerability of vultures at established windfarms

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Established wind farms are commonly situated on mountain ridges or hillsides, in order to make optimal use of prevailing winds, while soaring birds such as vultures are readily attracted to these areas by slope updrafts, which provide them with lift (Rüppell 1977). Research on the effects of turbines on local meteorology suggests that turbulence generated by rotors creates eddies that may enhance vertical mixing of momentum and heat, and the resultant warming and upward movement of the surface air appears to provide lift as it rises (Baidya Roy *et al.* 2004). Thus, it seems that vultures are often brought directly into contact with these structures as they seek thermal turbulence or ride orographic winds.

This is borne out by observations of Cape Griffons *Gyps coprotheres* at the Skeerpoort colony on the Magaliesberg mountain range, South Africa, which indicated that these vultures are adept at detecting, and readily seek updrafts, often following smaller birds such as Little Swifts

Apus affinis, on to these currents. Tandem flights occur when these vultures leave the cliffs to 'ride' the air currents in front and above the colony, and during the study period 62% of tandems noted took place on windy days or those with high thermal activity (Goodwin 2005).

Recent investigation into the visual field of the African White-backed Vulture *Gyps africanus* and Eurasian Griffon has shown these vultures to have a considerable field of vision, with a maximum 22-degree total binocular sector when the head is held in the horizontal plane. However, when the head is tilted forward, whilst foraging, a considerable blind sector is formed above and behind, as well as a forward blind sector suggesting that this may contribute towards collision vulnerability in these species. Vultures also appear to possess a considerable backward blind sector of around 70 degrees (or more) in the horizontal plane (Martin *et al.* 2012).

Some brief video footage is available of a second year Eurasian Griffon being struck by a turbine blade at Lentas in the Asterousia Mountains of southern Crete (www.epaw.org). This can now be reviewed in light of the new findings on the visual fields of the two *Gyps* vultures studied.

The immature vulture appears to have been attracted to the turbulence (and resultant lift) caused by the turbine blades, and was struck on the wing as it circled just above (and between) the blade tips. When this footage was viewed by individual frame, it could clearly be seen that the bird was 'clipped' on the wing by the leading edge of a blade tip, as it exited the path of travel on a down

swing. Although this bird would almost certainly have seen the blades from other angles as it circled, it appears as though the blade was momentarily in the rear, or overhead, blind sector of the bird as it passed. In this case, it is obvious that the bird would have been unable to take evasive action.

Possible mitigation methods for prevention of vulture strikes at established wind farms may vary according to the specific situation, and current options include the use of Supervisory Control And Data Acquisition (SCADA) systems (Davenport *et al.* 2011) as well as the strategic positioning of vulture restaurants to draw vultures away from these areas (Martin *et al.* 2012).

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