Remote Control Monitoring Techniques to Assess the Impact of Wind Farms on Raptors: a case study from Thrace, NE Greece

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Introduction – Why wind farms can threaten biodiversity?

The prefectures of Rodopi and Evros in NE Greece are internationally acknowledged as of high ornithological interest, hosting habitats of European importance for large birds of prey and populations of a unique assemblage of raptors (Poirazidis et al. 2009), containing the only remaining Black Vulture breeding colony in the Balkan Peninsula (Poirazidis et al. 2004, Skartsi et al. 2008, Vasilakis et al. 2008), and a high diversity for several taxa of plants and animals (Kati et al. 2004). A large part of them has been declared as a Windfarm Priority Area (WPA 1) by the Greek state. 50% of the WPA 1 is covered by seven Natura 2000 sites, five of which constitute SPA and two of them National Parks (Ruiz et al. 2004, WWF 2008). Since 2003, 9 wind farms (WFs) with 163 wind turbines (WTs) have been installed and are currently in operation. This number is expected to increase drastically in order to fulfil the objective of 480 typical WTs (930 MWe) set by the Greek state. Thus a big concern has been raised about the possible accumulative impacts of this overdevelopment on the avifauna of the area.

In this paper, we assess the collision mortality, caused by existent and planned wind farms, of a remnant population of the near-threatened Black Vulture (*Aegypius monachus*). Furthermore, we compare results and usefulness of three methods of data collection: visual monitoring, VHF telemetry and GPS telemetry.

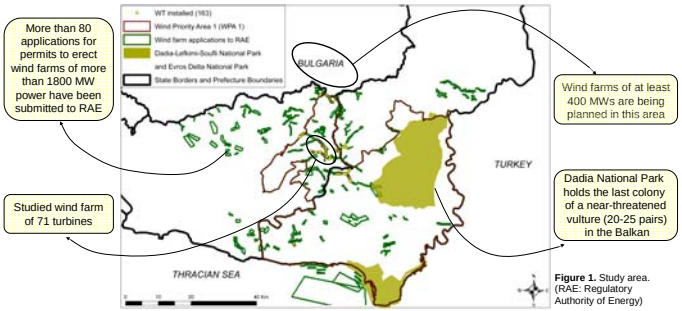


Figure 1. Study area. (RAE: Regulatory Authority of Energy)

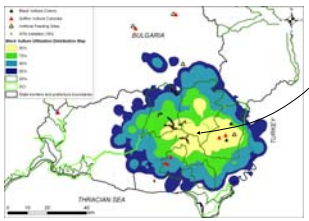
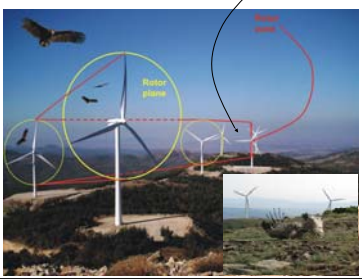


Figure 2. Black Vulture overall utilization distribution map. The valtures mainly use the area W and NW of the Dadia NP- breeding colony. This coincides with the main wind farm development in the area.



Actual found mortality: evidence of four collided *Gyps fulvus*, one *Hieraaetus pennatus*, an *Aythya nyroca*, an *Alectoris chukar*, 9 other birds of 7 species and 8 bat was found.

Methods – What have we done?

We assess the collision mortality for:

✓ the best studied wind farm of 71 turbines using data from two years (2004-2005) visual monitoring, three years (2004-2006) radio-tracking of several individuals (10, 8, 5 respectively) and one year data GPS telemetry of three individuals.

✓ the hole WPA assuming that the construction of 480 turbines inside the WPA but outside the NPs and without sensitive siting using the data form the GPS telemetry.

Using the affirmation data sets we asses proportion of time that species spend in the survey area. Finally, applying the Band-Model (Band et al. 2007) combined with rates for active avoidance of the turbines, we evaluated the impact caused by existent and planned wind farms on the species.

Parameters used for the Band-Model:

Technical parameters		Avian parameters		habitat use	
				Method	Presence in the windpark per individual (min/day)*
number of turbines	71	Body length (cm)	130		
rotor radius (m)	26.1	Wing span (cm)	280	VHF	3,0
max width of rotor blades (m)	2.25	Activity period (h/day)	12	GPS	1,6
pitch (°)	5	Presence in critical flight height (%)	68	VIS	1,1
rotation period (sec)	3	Flying speed (m/s)	10		

*for further calculations we assumed an average population of 80 individuals

Results – What have we found?

For the best studied wind farm of 71 turbines, established in the foraging area of the vultures, a yearly mortality of 1 to 5 vultures (depending on assumed avoidance rate and applied method of data collection) has to be assumed.

Assuming the construction of 480 turbines inside the WPA but outside the NPs and without sensitive placement, the mortality would be 10 to 20 vultures per year.

Our results also revealed that the Remote Control Monitoring Techniques have advantages over visual monitoring for delivering more precise and trustable results, in particular at larger scales.

Conclusions

•The assessed by the model mortality is in agreement with the actual found mortality caused by existent wind farm for the Griffon Vulture. A species with quiet similar size and flying behavior that inhabits the area in larger numbers.

•The assessed mortality of the hole development would have a severe impact on the population of the endangered Black vulture if sensitive placement will not be achieved.

•The estimated collision rates are far too high for maintaining a population, that is heavily impacted by other factors (mainly unintentional poisoning), and that consists in only 20-25 breeding pairs.

•The estimated mortality has to be evaluated for species in combination with population viability analyses.

• The survival of this endangered population depends on the management of the areas outside of the National Park.

•Applying Remote Contorl Monitoring Techniques, unbiased and higher sample sizes can be obtained, being crucial for a reliable analysis of space use and flying height of the target species.

Recommendations

•No wind farms inside Dadia NP, nor in a buffer of 15 km around the colony, nor in further highly used areas (e.g. the 50% polygon, cf. fig.2).

•Sensitive siting of the wind farms based on sound ornithological studies including a continuous post-construction monitoring.

•Implementation of a monitoring scheme for the continuous evaluation of the accumulative impact.

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