Monitoring of Bats and their Collision with Wind Turbines – Suggested Methods and first Results

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Aims

- To propose a minimum version of bat monitoring related to the impact of wind turbines on bats, viz, 1. assessment of bat activity and species structure of a bat assamblage before/after construction of wind turbines, and 2. estimation of bat mortality based on collection of bat carcasses.
- To present the first preliminary results of monitoring bat activity and mortality near wind turbines on the territory of the Czech Republic.

Monitoring of bat activity and mortality

Our proposal originated from a modification of the document (Rodrigues et al. 2006) published as the Anex 1 to Resolution 5.6 (Eurobats, Ljubljana 2006). Unfortunately, it was impossible to follow the recommendations in full, due to particular situation in the Czech Republic. Instead, following methods were used:

Fig. 1. Automatic bat-detecting at 1.5 m above ground

Fig. 2. Automatic bat-detecting at the height of 50 m

Fig. 3. Equipment for bat-detecting on line transects

1. Assessment of bat activity

- regular automatic recording of bat ultrasound signals at selected points close to the planned or existing wind turbines using the FD bat detector, MD stereo-recorder and link stereocable lodged in a plastic box (about 0.5 kg) either (a) placed on a tripod at the height of 1.5 m above ground (Fig. 1.), or (b) suspended from a latex balloon at the height of 50 m (Fig. 2); each recording started at the sunset and lasted 1 h;
- bat detecting by walking on line transects in representative habitats in the circle area up to 1 km from the planned/existing wind turbine using the TE bat-detector, DAT or standard stereorecorders (Fig. 3), along with auto-matic point detecting;
- recordings were analysed by the BatSound software on PC in the laboratory;
- the level of bat activity was assessed as the number of positive minutes when bat calls were heard (+min) per one hour of recording (+min/h);
- species structure of the respective bat assemblage was expressed as relative abundance of individual species or pairs of sibling species in per cent of the total of bats recorded.

2. Records of bat casualties

- bat carcasses were collected within a circular area with the wind turbine in its centre and the radius equal to the height of the turbine; the carcasses were located by a man alone or with a purpose-trained dog, along lines 4-8 m distant from each other and parallel to sides of neighbouring crops, with respect to the density and height of the growth (all wind parks studied were situated among fields);
- collecting of bat carcasses was carried out in regular 2-7 day intervals from March to November 2006 (non-hibernation period).

Fig. 4. Dogs (Australian shepherd) trained to search carcasses

Examples of preliminary results

1. Bat activity (+min/h)

In 2008 flight activity of bats was studied around 2 scheduled and 1 existing wind turbines near Rozstání and Drahany, respectively (C-Moravia, CR). The season was divided into three periods in relation to the reproductive cycle of bats, i. e. pregnancy (IV - ½ VI), lactation (½ VI - ½ VII) and post-lactation plus migration (½VII - X). The level of activity significantly differed both between particular points and particular periods (K-W test H = 8.042, p = 0.018) (Fig.5). The lowest activity was recorded close to the operating wind turbine in Drahany compared with two sites of scheduled wind turbines near Rozstání. Concerning the season, flight activity was lower during the pregnancy period while during other periods it was higher and similar (Fig. 6). The relative activity at ground level (1.5 m) was significantly lower than that at the height of 50 m (M-W test U = 14121,00; p<0,001). Only the presence of *Nyctalus noctula, Eptesicus serotinus* and *Pipistrellus pipistrellus* was revealed by automatic point detecting compared to 14 bat species recorded by line transects bat detecting (Tab. 1).

2. Bat mortality

In total, 20 dead bats of 5 species were found at 5 wind turbines near Břežany (S-Moravia, CR) in 2006. The sample was dominated by *Pipistrellus* spp. and *Eptesicus serotinus* (both 40%) followed by *Nyctalus* spp. (20%) and *Vespertilio murinus* (10%) (Fig. 7), most bats have been killed in July (45 %) and August (30%) (Fig. 8).

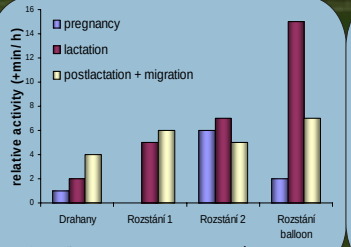

Fig. 5. Activity in particular points

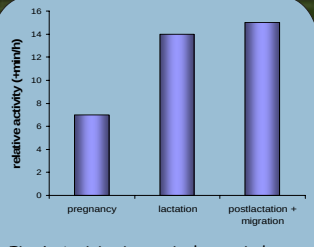

Fig. 6. Activity in particular periods

Tab. 1. Bat species detected on line transects

species	%
P.pipistrellus	28.9
E.nilssonii	17.4
N.noctula	118
M.daubentonii	11.5
P.auritus/austriacus	8.5
M.myotis	4.6
E.serotinus	3.9
B.barbastellus	3.6
N.leisleri	3.0
M.mystacinus/brandtii	3.0
P.nathusii	1.6
M.nattereri	1.0
M.emarginatus	0.7
R.hipposideros	0,7
Total	100,0

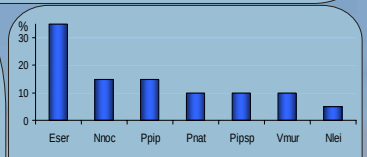

Fig. 7. Species composition of killed bats

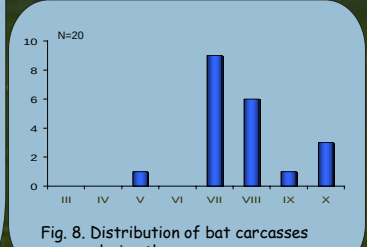

Fig. 8. Distribution of bat carcasses during the season

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