

Range of a Bechstein's bat colony overlapping a motorway

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Introduction and study site

Causing fragmentation and increasing mortality, motorways pose a threat to many bat species. Especially for clutter-adapted species motorways are considered to have barrier effects on their flight paths from roosts to their foraging areas as well as between different foraging areas (Kerth & Melber 2009). Representative for the group of gleaning bats we investigated the habitat use of Bechstein's bat (*Myotis bechsteinii*) before and after the construction of a wildlife overpass over an existing motorway in Germany.

As a mitigation measure for the construction of a federal street (B50) a wildlife overpass was built over an existing motorway (A1) to regain connectivity of old oak forests situated on both sides of the motorway. Its ecological efficiency is tested throughout a Research and Development Project funded by the Federal Highway Research Institute of Germany (BAST). One focus of the project is to monitor the acceptance of the wildlife overpass by the local *M. bechsteinii* population.

For our study we examined a very fit maternity colony of approximately 100 adult females inhabiting an old 32 ha oak forest which is cut by the motorway A1 south of Wittlich in Rhineland-Palatinate. The spatial behaviour of the colony was monitored via radiotracking of 18 females in 2006, 2008 and 2009.

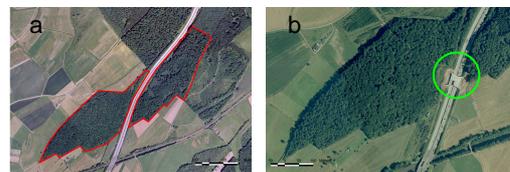


Fig. 1: Study site (marked in red) on both sides of the motorway A1. a) before construction of the wildlife overpass, b) during construction of the wildlife overpass (marked in green) 2007

Methods

Data collection concerning the habitat use of the maternity colony of Bechstein's bat took place between May and August in 2006, 2008 and 2009. In 2006 we documented the situation without any connecting elements over the motorway in a fragmented habitat. In April 2008 the wildlife overpass was opened and its efficiency was tested in 2008 and 2009.

Bats were caught with mist nets in the old forests on both sides of the motorway as well as on the wildlife overpass. The tagged females were tracked by triangulation for at least three consecutive nights. Data were usually collected by foot or if necessary by car. In total we radiotracked 18 adult females of one maternity colony.

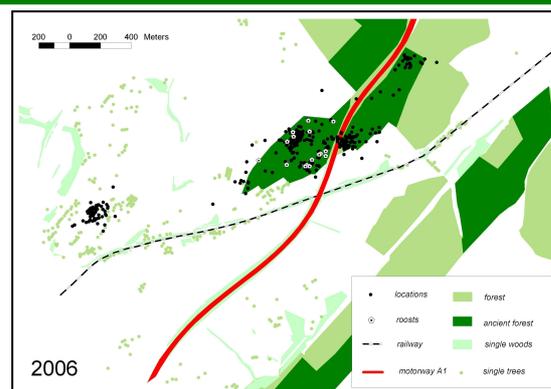
Tab.1: Overview of radiotracked females

Year	Period	Number of individuals	Nights/individual
2006	28.7. - 24.8.	6 ♀	3
2008	15.5. - 21.7.	5 ♀	4-5
2009	2.7. - 23.8	7 ♀	3-7

Results 2006 – without wildlife overpass

- All roosts were on the western side of the motorway
- Four out of six females foraged only on the western side of the motorway
- Two out of six females crossed the gap and foraged on both sides of the motorway in spite of the complete absence of any connecting elements over the motorway
- These two females crossed the motorway several times per night

Fig. 2: Habitat use of radiotracked females in 2006 without wildlife overpass



Results 2008 & 2009 – with wildlife overpass

- The wildlife overpass was used by bats already during the first vegetation period after its opening. Like in the adjacent woodlands the majority of bats captured by mistnetting was *M. bechsteinii*.
- In 2008 and 2009 the colony used roosts on both sides of the motorway. This is the first proof of roost switching over a highly frequented motorway.
- Five out of twelve females foraged and roosted on both sides of the motorway.
- Distance between some regularly used tree roosts and the motorway was only 20 m.
- The centre of the colony with the majority of roosts was always on the western side of the motorway.
- In both years, only one radiotracked female used the wildlife overpass for crossing the motorway. The majority of the other crossings took place a bit further north where the motorway cuts into landscape.

Tab.2: Foraging areas and roosts of radiotracked females

	Number of indiv. with foraging sites and roosts on both sides of the motorway	Number of indiv. with foraging sites on both sides of the motorway and roosts west of the A1	Number of indiv. with foraging sites and roosts west of the A1	Number of indiv. with foraging sites west of the A1 and roosts east of the A1
2006 - No overpass	-	2	4	-
2008 & 2009 - Wildlife overpass	5	2	4	1

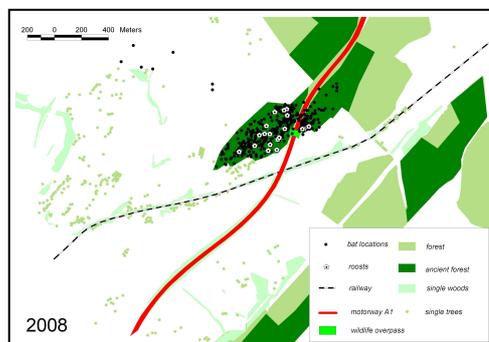


Fig. 3: Habitat use of radiotracked females in 2008 – first year with wildlife overpass

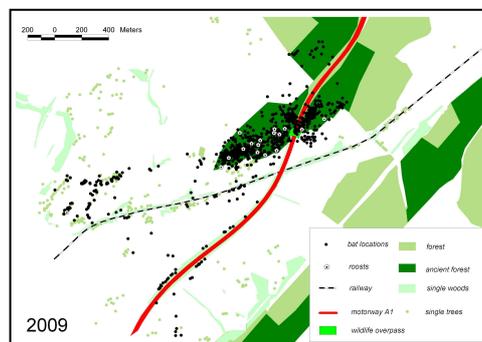


Fig. 4: Habitat use of radiotracked females in 2009 – second year with wildlife overpass

Conclusion

Although being a highly frequented motorway (25.000 vehicles/24h) the A1 does not seem to act as an absolute barrier on the investigated colony. The motorway was crossed regularly during foraging and for roost switching. The biased distribution of roosts might be a result of the colony's boundaries or might be an indication of a slight barrier effect of the A1 concerning the choice of roosts. These findings are in contrast to the results of another radiotracking study in Germany where an absolute barrier effect of a motorway on the habitat use of the investigated colonies of *M. bechsteinii* was observed (Kerth & Melber 2009). One reason for the different behaviour of the colonies in the two studies is obviously the degree of fragmentation and size of available mature forest. Although the forest on the western side of the motorway is an ancient woodland of very good quality the size of 17 ha might not offer enough suitable habitat for foraging areas for the estimated 100 adult females of the colony. Thus, the animals need to explore other forests, orchards and treelines for foraging in the surroundings which means crossing agricultural land, railways or the motorway. Another crucial point seems to be the motorway design. In the area where most of the animals crossed, the A1 cuts into landscape making it easier for the animals to cross the gap. To date we were not able to determine the height of the crossings. This question will be in focus of further investigations. Although the wildlife overpass was used by Bechstein's bats already 3 months after its opening, the majority of the crossings of radiotracked females still took place in other regions. The investigations of the following years will show if there will be an increased use of the wildlife overpass.

Literature

Kerth G, Melber M. Species-specific barrier effects of a motorway on the habitat use of two threatened bat species. Biological Conservation, 142: 270-279 (2009)

