



# Case Studies on Monitoring Bats using Autonomous Telemetry Units

Franziska Schäfer\*, Annika Segschneider, Shahruckh Kamran, Jörg Bettendorf

\* Corresponding Author – Chiropteran Team, FÖA Landschaftsplanung GmbH, franziska.schaefer@foea.de



Poster

FÖA Landschaftsplanung GmbH

Poster presentation at the conference on Biodiversity Monitoring in Luxembourg, Neumünster Abbey 2024

## Potential Questions

Omnidirectional stations from tRackIT Systems<sup>[1]</sup> are suitable for presence-absence studies. Point Prescription is possible when ranges overlap.

**Wind Power Project** – Does the immediate area of operation contain essential foraging habitats and / or regularly used bat roosts?

**Road Construction Project** – Does the immediate area of operation contain essential foraging habitats, regularly used roosts and / or frequently used flight paths of bats?

## Method

- The systems can automatically locate tagged animals.
- Transmitter signal strength and distance (up to approximately 1000 m) are linked using a statistical method to determine the distance from foraging/roosting areas to the automatic telemetry units.
- Measurement errors are usually around 30 m (significantly less than manual telemetry).
- Up to 40 animals can be tracked simultaneously and over the entire transmitter runtime.
- Method can be used for small-scale species.
- Received data is transmitted and visualized in real time.
- At the end of the monitoring season, an evaluation is carried out by tRackIT Systems<sup>[2]</sup>.



Fig. 1: Autonomous telemetry unit with an omnidirectional antenna from tRackIT Systems in a mixed deciduous forest clearing. The unit was placed as close as possible to the planned wind turbine site to obtain precise information on the foraging behavior of the animals within a 400 m radius of this point.

## First Case Study

**Wind power project near Trier, Germany** – presence-absence study on *Plecotus auritus* to understand whether the species has essential foraging habitats or regularly used roosts in the areas of immediate impact.

- Autonomous telemetry units with omnidirectional antennas were placed near the planned Wind turbine sites.
- Bats were captured and tagged between May and August in 2023.
- A total of 11 brown long-eared bats from a maternal colony were tagged and tracked throughout the period.

➔ This enabled us to locate the roosting center (outside the turbine radius) and the foraging habitats within a 400 m radius of the turbine sites.

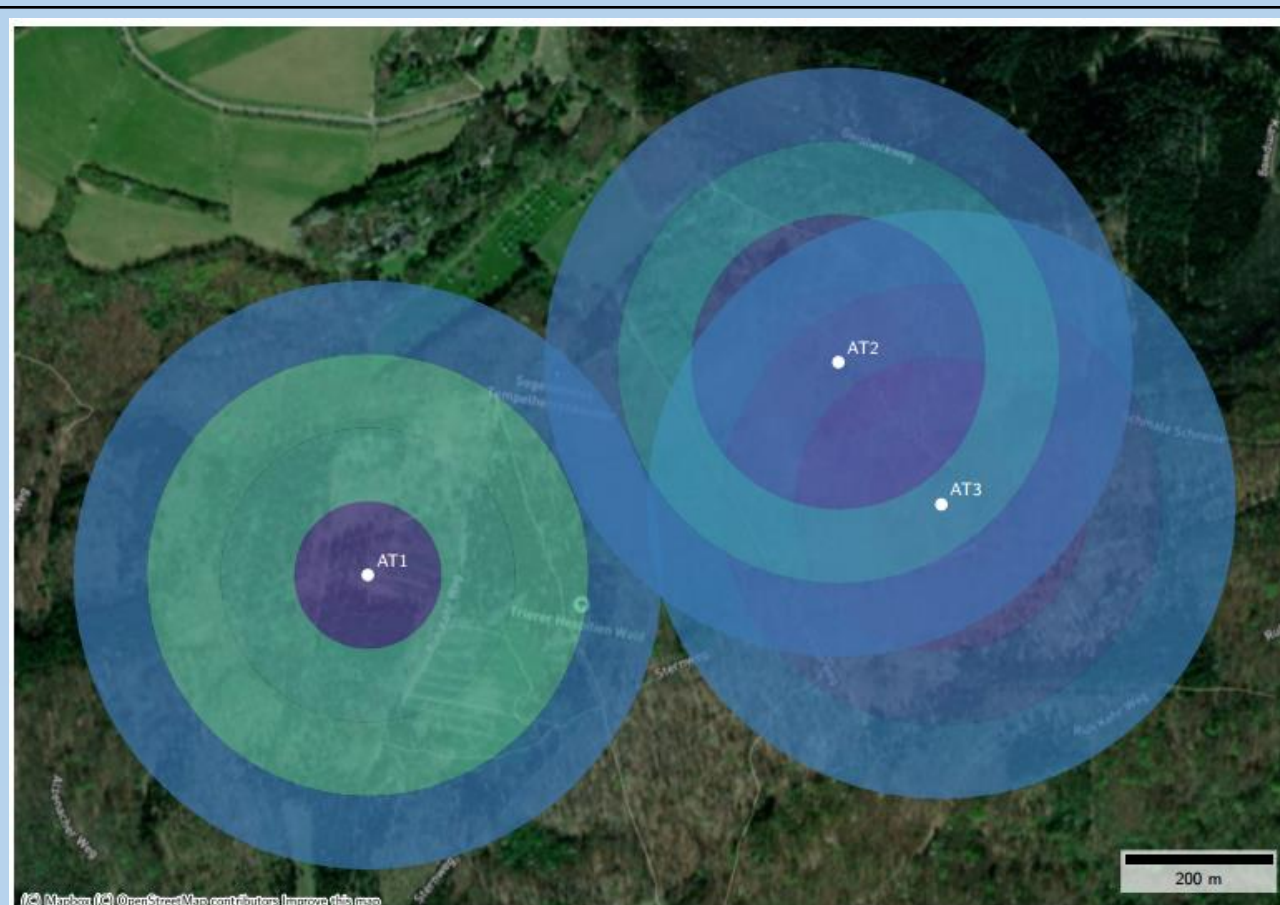


Fig. 2: Spatial use of *Plecotus auritus* colony around the planned wind turbine sites.



Fig. 4: Tagged brown long-eared female at the wind power project near Trier.

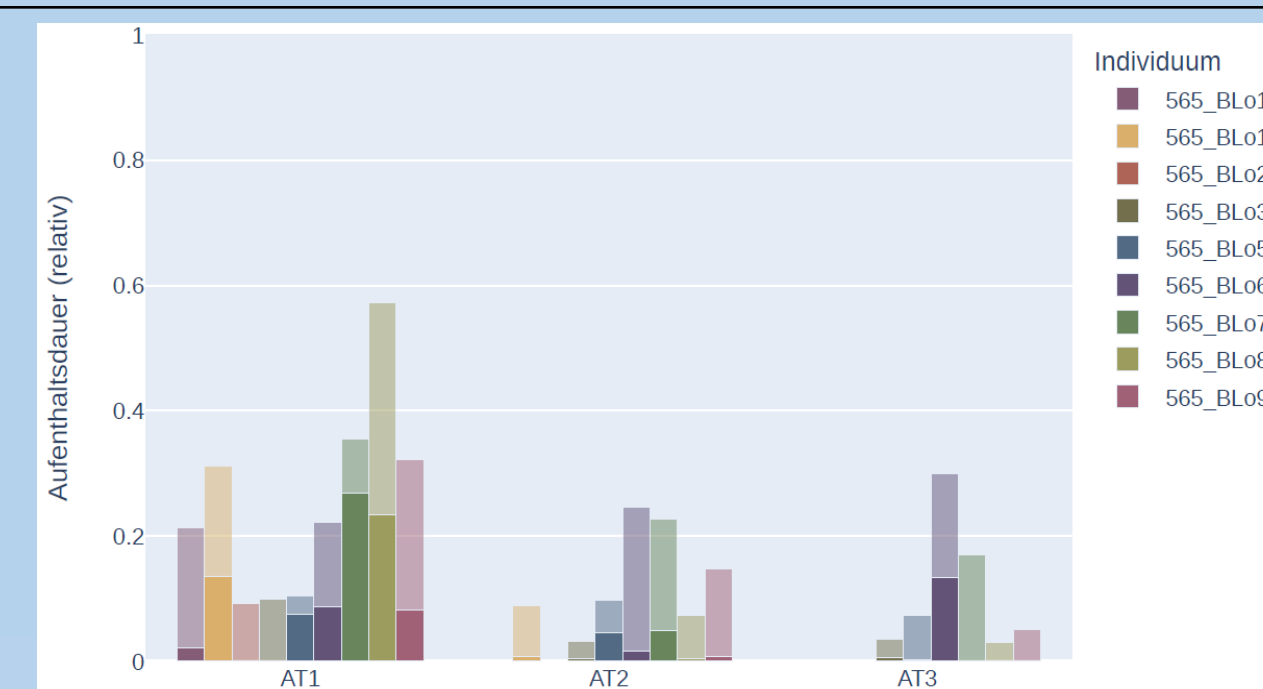


Fig. 3: Average relative residence time of individuals in the *Plecotus auritus* colony within a 200 m radius (dark colour) and within a 400 m radius (light colour).

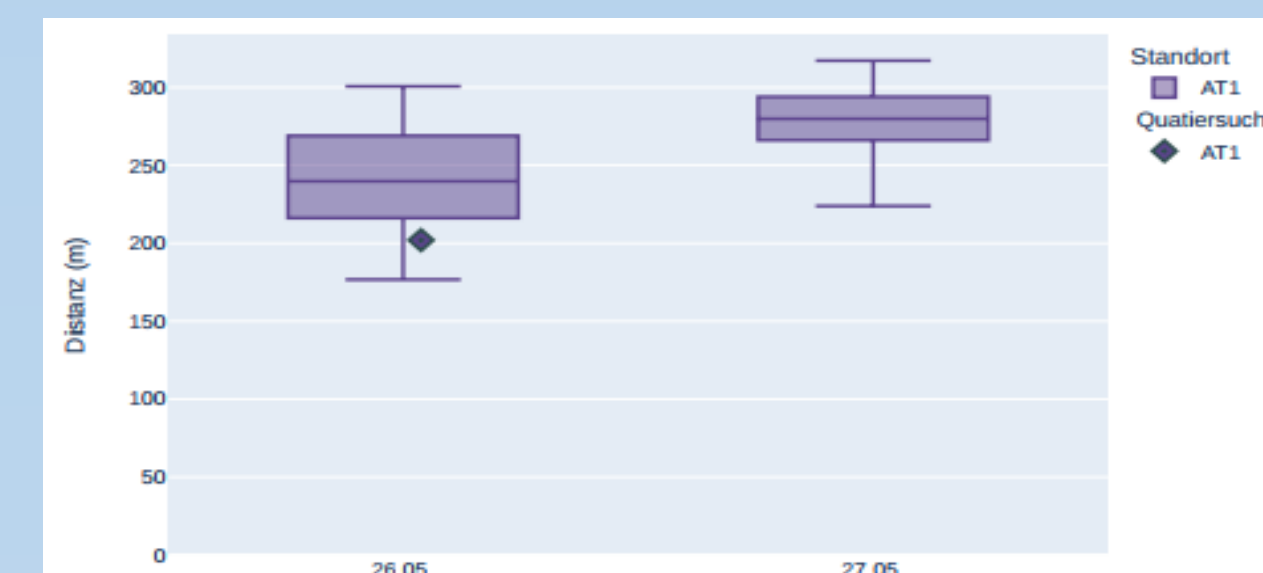


Fig. 5: Comparison between the calculated distance of BLo2's roosts to AT1 using the tRackIT System and the manually searched roost.

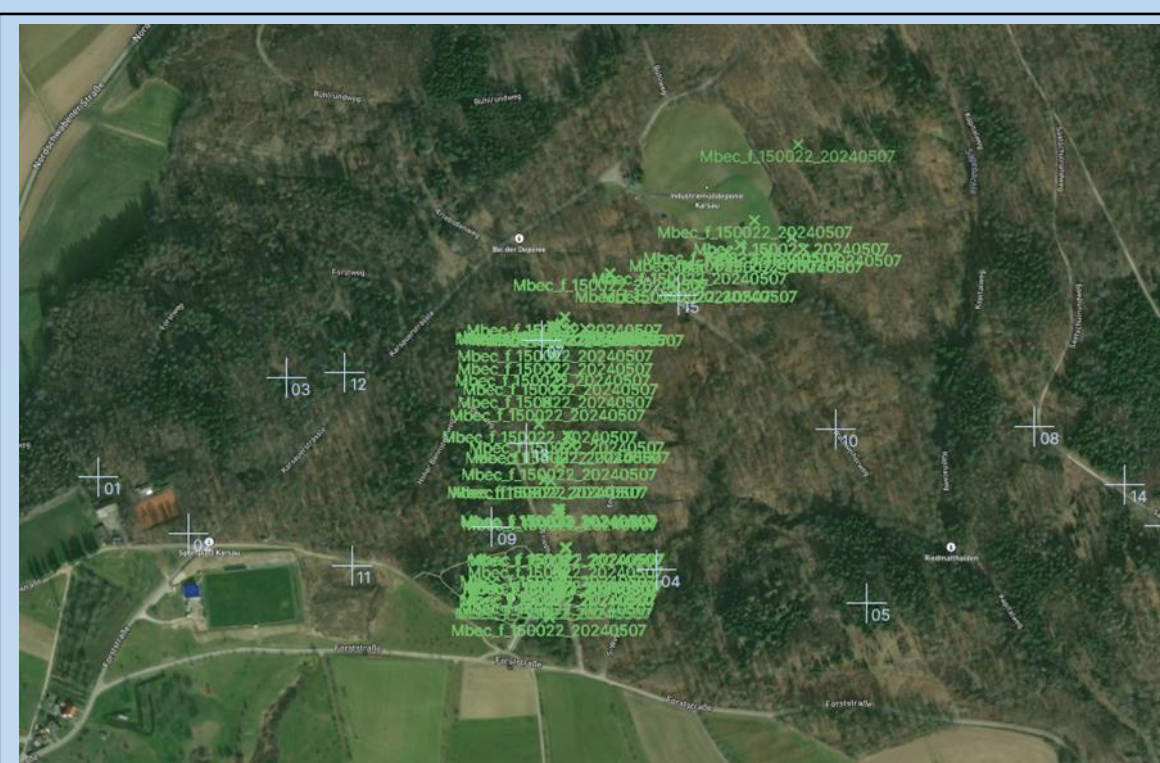


Fig. 6: Bef1 leaving roost to forage outside study area – flight path.

Blue cross: Autonomous telemetry unit; Green: recorded location of the tagged animal.

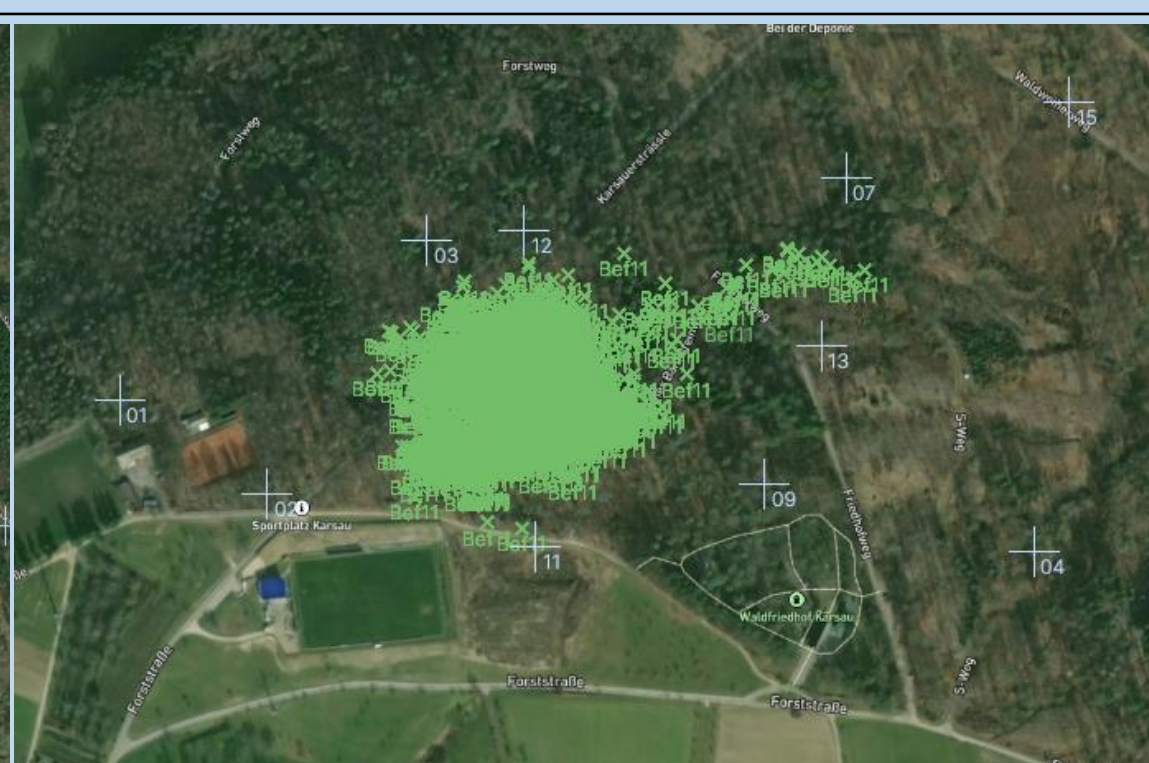


Fig. 7: Small-scale foraging behaviour of Bef11 in the middle of the study area.

## Second Case Study

**Road construction project on the A98 highway** – locating essential foraging habitats, regularly used roosts and frequently used flight paths of a *Myotis bechsteinii* colony.

- Autonomous telemetry units with omnidirectional and directional antennas were installed along and to the north and south of the planned road.
- Bats were captured and tagged between May and August in 2024.
- A total of 11 Bechstein's bats from a maternal colony were tagged and tracked throughout the period.

➔ We were thus able to monitor the home range of the tagged animals and cover the 50-95% kernels of the maternity colony

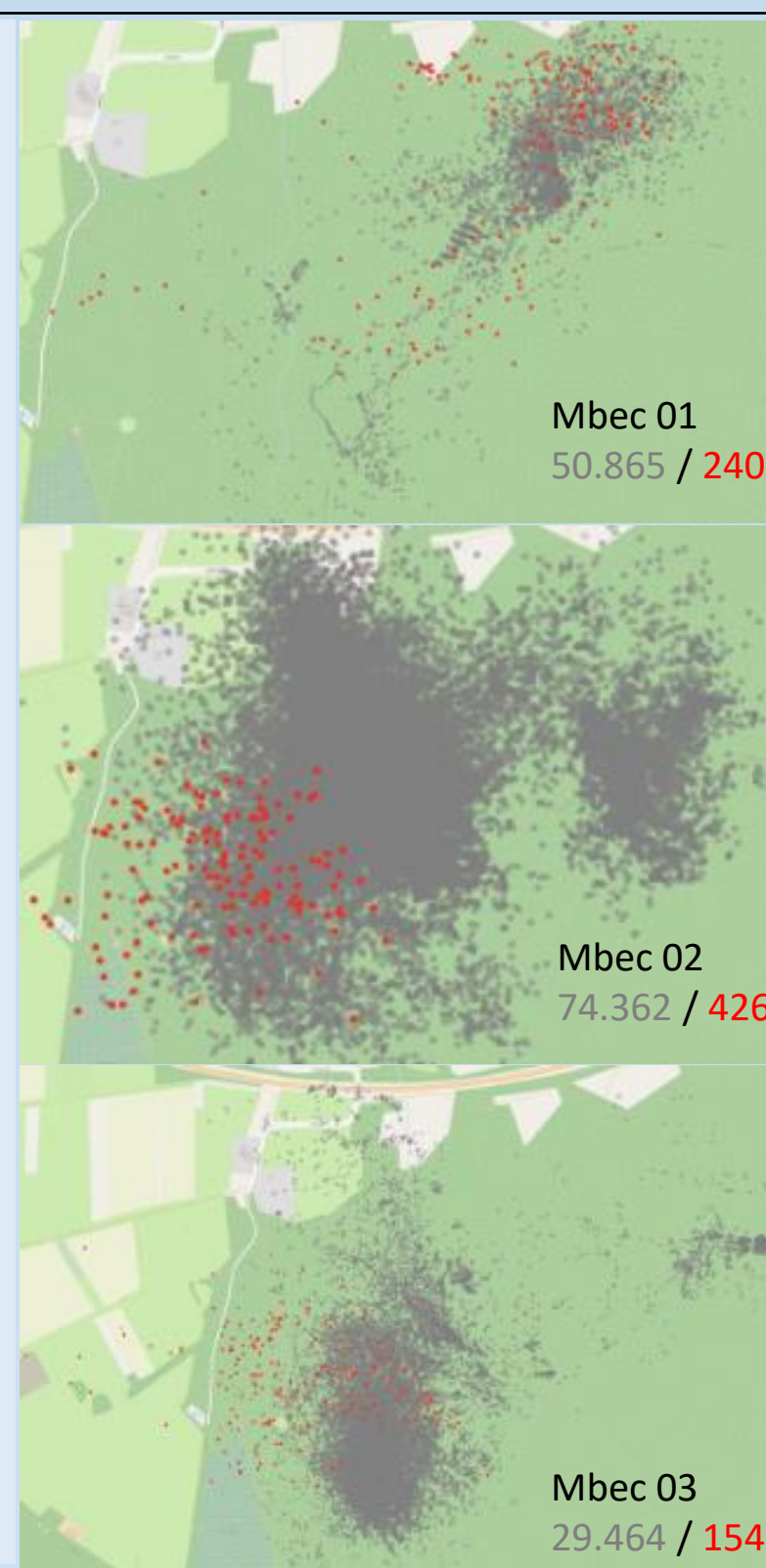
## Advantages of Automatic over Manual Telemetry

- Personnel costs only for assembly and disassembly.
- Up to 40 animals can be tracked simultaneously.
- No increasing costs with increasing number of individuals examined.
- Better temporal and spatial resolution (every 10 seconds).
- Tracking of the tagged animals over the entire transmitter runtime. Also precise positioning with directional antennas.

Fig. 8: Comparison of GPS track and position calculated by the automatic telemetry unit with tRackIT directional antennas<sup>[3]</sup>.



Fig. 9: Three different Bechstein's bats monitored with manual radio telemetry (red dots) and multilaterations with the tRackIT System (grey dots). The numbers show the sum of positions recorded with each method<sup>[3]</sup>.



## Sources

- [1] tRackIT Systems GmbH Webpage (2024)
- [2] Höchst, J., Gottwald, J., Lampe, P., Zobel, J., Naus, T., Steinmetz, R., & Freisleben, B. (2021). tRackIT OS: Open-source software for reliable VHF wildlife tracking.
- [3] Provided by Gottwald, J., tRackIT Systems GmbH (2024)

tRackIT Systems GmbH Webpage (2024)



Höchst, J. et al. (2021)<sup>[2]</sup>



### Automatic Telemetry (Costs for 3 Units)

Approximately 10,500 € (3,500 € per unit)

- Plus personnel costs for assembly and disassembly.
- Plus costs for cartographic preparation of the data.

### Manual Telemetry (for 10 Tagged Individuals, each Individual 2 Nights with 2 Persons)

Approximately 35,000 €

- Cost estimate on an hourly basis only.
- Plus logistics.
- Plus materials.
- Plus costs for cartographic preparation of the data.