Habitat modelling and collision risk prediction of the red kite in Europe based on high-resolution GPS telemetry tracking within the LIFE EUROKITE project

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1. Introduction

The LIFE EUROKITE project is providing a representative image of the European red kite population by tagging an ever-increasing number of raptors. Over 3,000 red kites from 14 European countries have been tagged. The goal of LIFE EUROKITE is to use this data to accurately record, assess and reduce anthropogenic mortality.

Illegal activities, i.e., poisoning and shooting, were identified as the most prevalent cause of death. Telemetry allows identifying and thus collect proof on potential perpetrators of bird crime. This makes it possible to file a complaint, which obliges the authorities to investigate. Potential perpetrators are also deterred by increasingly loud reporting.

Infrastructure projects, including the expansion of renewable energy sources, can contribute to an increase in anthropogenic mortality. In order to reconcile species conservation and climate protection, careful planning is required that takes into account potential risks for endangered species such as the red kite. This is where the space use collision risk model (RKR model) comes in. This approach integrates the aspects of habitat use and collision risk of the relevant species.

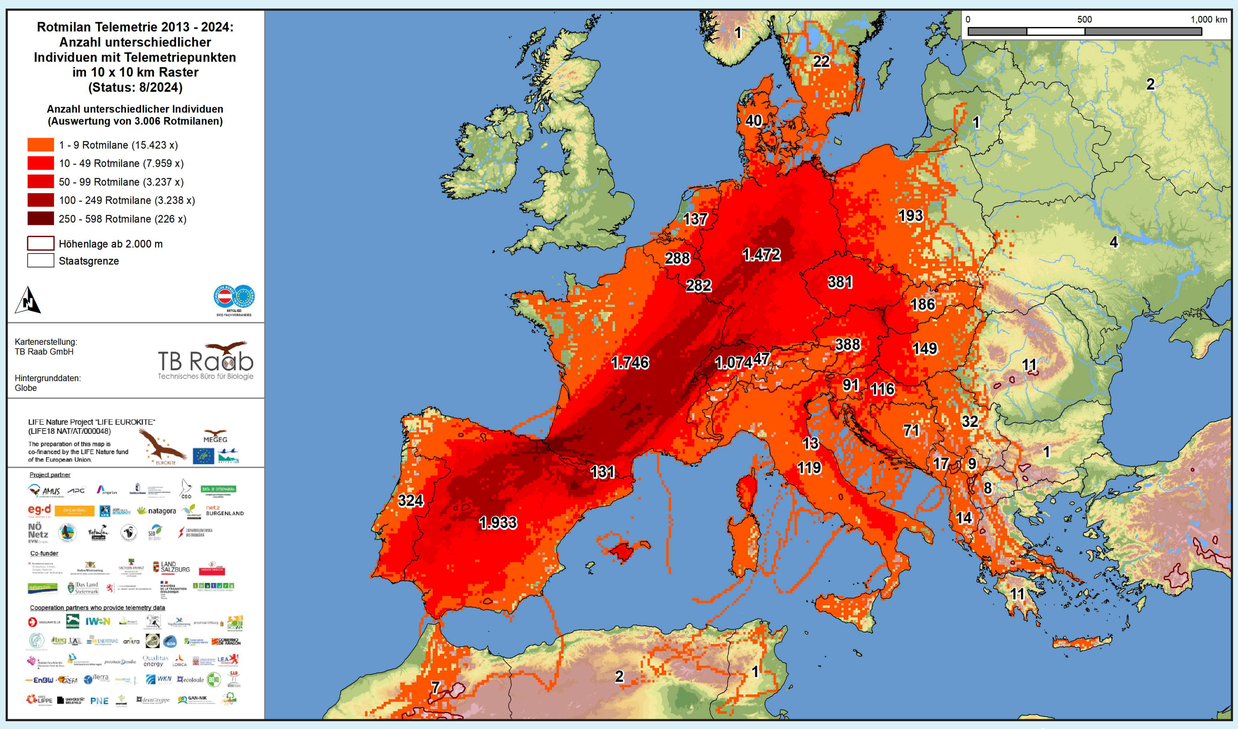

Figure 1: Number of different tagged red kite individuals with telemetry data points within the 10 x 10 km^2 raster cell between 2013-2024 in Europe (without UK). The numbers in the countries show the total number of different red kite individuals in that country.

2. Use of space

In a first step, the RKR-model is used to forecast the three-dimensional project-specific habitat use of the red kite based on the habitat potential. Factors such as forest, pastures, settlements, etc. are taken into account. Among other things, it becomes clear that borders between agricultural fields, settlement borders and grassland in particular exert a strong attraction on the red kite, while forests have a barrier effect.
Figure 2 compares the prediction of the RKR-model for a breeding red kite with real telemetry data. In the mathematical evaluation of the model quality for more than 300 breeding years of red kites using the "sum of least squares", the RKR model emerges as the best available tool for predicting the spatial use of the red kite [1].

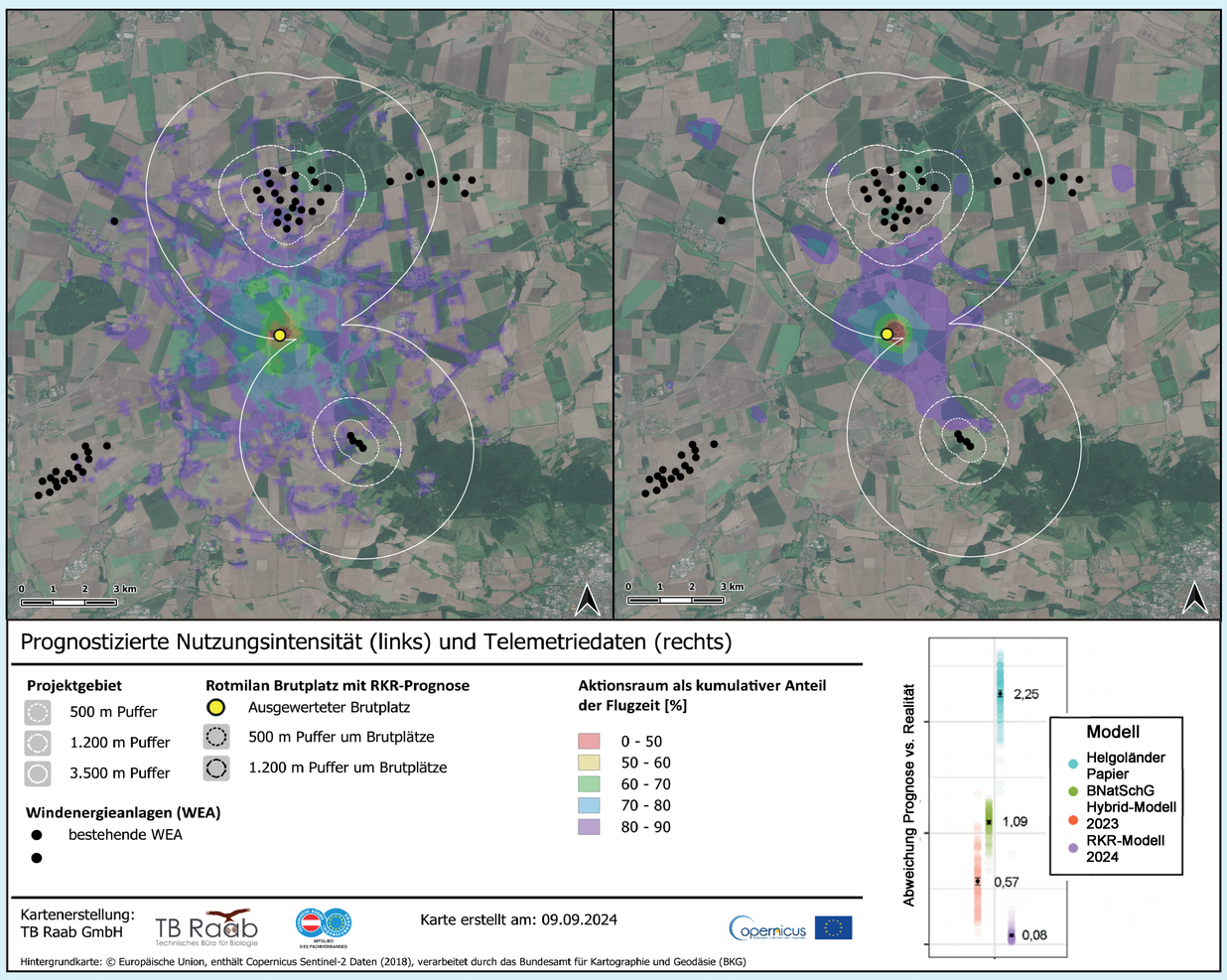

Figure 2: Usage intensity calculated using the RKR model compared with the habitat usage from the telemetry data.

3. Risk of collision

In a second step, the predictions of the probability density per breeding site are combined with the wind turbine (WT)-specific data of the planned wind farm in order to predict the average number of seconds spent in the risk area, i.e. the airspace covered by the rotor blades, per individual and season. The flight speed, the body dimensions of the bird and the empirically determined avoidance behaviour are taken into account on a species-specific basis. The avoidance behaviour of bird individuals towards wind turbines can thus be evaluated on basis of second-resolved telemetry data.
Figure 3 demonstrates that red kite individuals show active avoidance behaviour towards wind turbines.

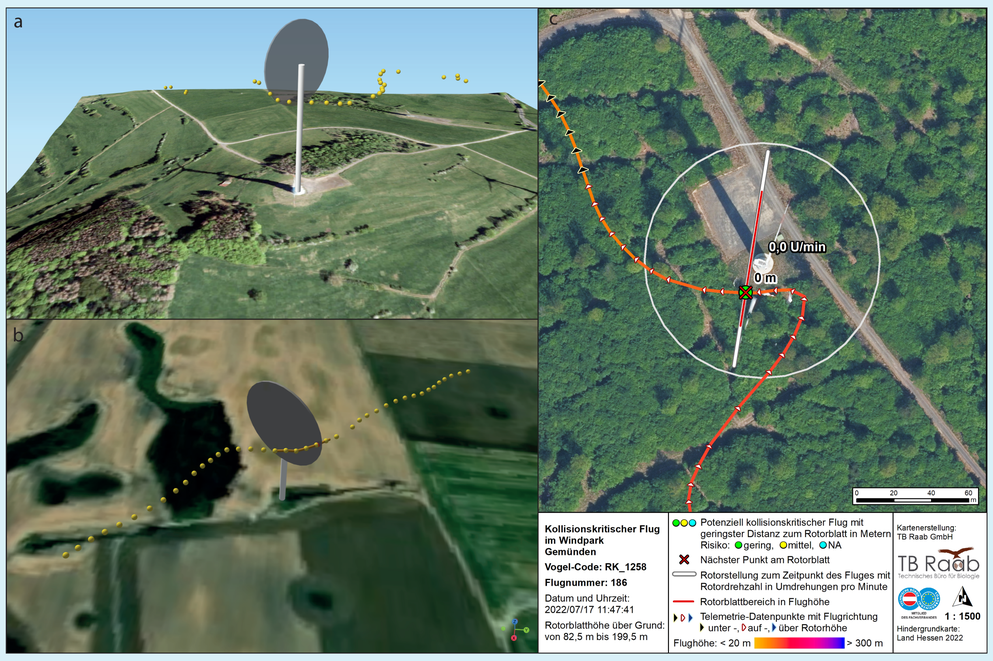

Figure 3: Illustration of collision-critical flights of the red kite: (a) avoidance behaviour of a red kite towards a wind turbine using camera images; (b) avoidance behaviour via telemetry data; (c) documented flight of a red kite with a stationary rotor blade, from telemetry data [1, 2].

4. Bird protection and mathematics – The space utilization collision risk modell (RKR-model)

The RKR model is a tool that enables species protection to be considered appropriately and comprehensibly when expanding infrastructure. As a probabilistic calculation method, the RKR model uses modern remote sensing technologies (e.g. Copernicus) and telemetry data from tagged birds to provide standardized and comprehensive, reproducible and precise results regarding the habitat use and the collision risk of breeding birds close to wind turbines. It empirically accounts for all factors relevant to the collision risk according to the current state of research and is therefore the most reliable method for assessing the collision risk (significance) of specific planned WT projects from a species conservation perspective.

The protection of breeding birds from collisions with wind turbines is of high priority in Germany. A so-called "significance analysis" is therefore required for breeding bird species at risk of collision. This analysis checks whether a planned project significantly increases the risk of killing individual breeding birds. With the amendment of the German Federal Nature Conservation Act (Dec 2022), the distance (close range, central assessment area, extended assessment area) of the project to the breeding site of a breeding bird species at risk of collision is the deciding factor in the first assessment step. If there is at least one validated breeding site within the central assessment area (1200 m for the red kite), the significant increase in risk must be refuted or protective measures must be taken. In this context, the RKR model helps to objectify the assessment of projects in the area of conflict between species conservation and the energy transition.

5. Summary

In summary, the "RKR model" was developed as a new method that can accurately and reliably predict both the local habitat use and the project-specific collision risks of breeding birds for constellations of breeding sites, habitats and planned wind turbines. The development process was accompanied by a large number of people from politics and various interest groups and areas of expertise, and the model was found to be suitable for use in future significance assessments by consensus.

For the red kite, the current RKR model is considered finished; the white-tailed eagle, white stork, osprey and black kite habitat use are currently being studied and will likely be incorporated into the calculation rule in the near future.

"In this review report, the Federal Government advocates introducing the probabilistic method for calculating the collision risk of breeding birds at onshore wind turbines in 2024; initially for the red kite, then gradually for other breeding bird species."

Bericht der Bundesregierung (Dez. 2023)

"Based on the latest scientific findings, the probabilistic calculation is the only method to date that is actually capable of fulfilling the criteria for significance assessment defined in the law and case law."

Positionspapier Probabilistik & Windenergie (BWE) (Feb. 2024)

The RKR model provides timely, well-founded, project-specific forecasts of land use and collision risk of breeding birds for each breeding site-habitat-WT combination.

Quick and easy - project-related information

www.predictbird.de

References
[1] M. Mercker, R. Raab, T. Liesenjohann, J. Liedtke, J. Blew (2024): Fortsetzungsstudie Probabilistik - Das „Raumnutzungs-Kollisionsrisikomodell" („RKR-Modell"): Fachliche Ausgestaltung einer probabilistischen Berechnungsmethode zur Ermittlung des Kollisionsrisikos von Vögeln an Windenergieanlagen in Genehemigungsverfahren mit Fokus Rotmilan. Im Auftrag des Bundesamts für Naturschutz.
[2] R. Raab, R. Raab, K. Raab, J. Wessely, E. Julius, M. Raab, M. Reichenbach (2024): Erweiterung der Wissensbasis zum Flugverhalten des Rotmilans mittels GPS-gestützten Telemetrie-Daten in Hessen. Im Auftrag des Hessischen Ministeriums für Wirtschaft, Energie, Verkehr, Wohnen und ländlichen Raum. – not yet published

The 18 project partners and 10 co-financiers of the LIFE EUROKITE project (the 75 cooperation partners can be found on www.life-eurokite.eu):