



Track Them Down

Telemetrie von Holzbienen im Nationalpark Neusiedlersee-Seewinkel

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Tag der Nationalparkforschung 17.10.2025



INTRODUCTION



- Knowledge on specific habitat requirements and spatial ecology improve pollinator conservation efforts
- But collecting spatial data remains challenging
- Technological advances enable active tracking of large bees



Traditional telemetry with handheld receiver



Xylocopa valga ♂ with VHF transmitter

Photos: H. Wacker & S. Kratschmer



RESEARCH OBJECTIVES 1



2022 – first study year:

- Initially: *Bombus muscorum* and *Megachile sculpturalis* as target species
 - Investigating ecological niches and estimating occurrence
- Problem: Transmitter size and weight too big !



B. muscorum



M. sculpturalis



RESULTS *BOMBUS MUSCORUM*



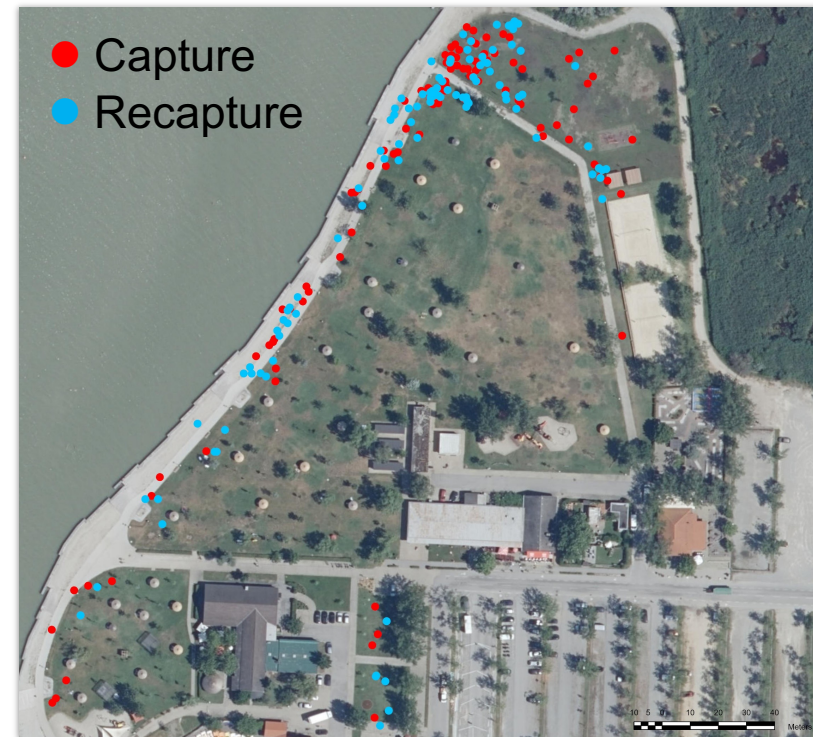
2022: No captures at known locations in and around Illmitz (naturbeobachtung.at)

Bombus muscorum

2022: High density at lido Illmitz

Capture-mark-recapture:

- 166 Individuals marked (5 ♂, 20 ♀ & 141 workers)
- 116 recaptures at lido
- Estimated worker population was 232 individuals (CI: 187-288)



B. muscorum Illmitz Strandbad 08/2022



RESEARCH OBJECTIVES 2

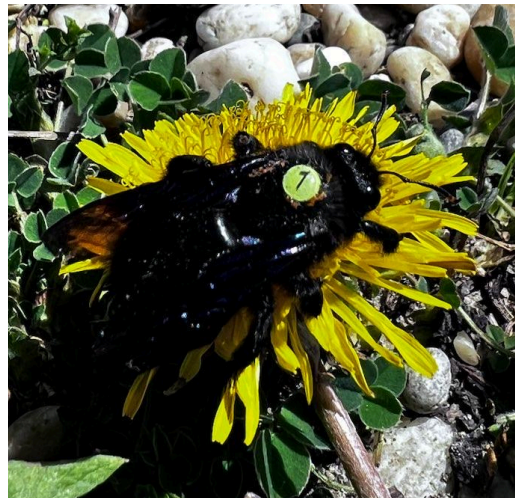


In 2023 we focused on the three Carpenter bee species (*X. iris*, *X. valga*, *X. violacea*) and investigated:

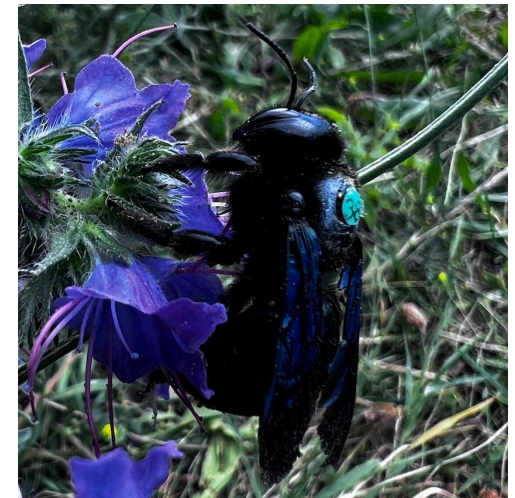
- Effect of transmitters on flight duration and number of flights
- Estimate population size around Illmitz in the national park Neusiedlersee-Seewinkel
- In depth knowledge on species specific foraging plants
- Apply and test new tracking approach using stationary receivers



Xylocopa iris ♀



Xylocopa violacea ♂

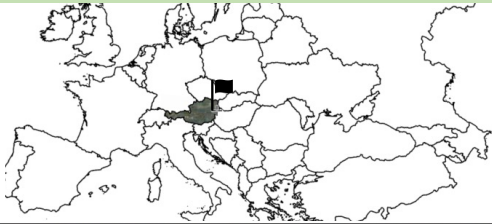


Xylocopa valga ♀

Photos: A. Planitzer



STUDY AREA



Telemetry study area and receiver distribution

- “Neusiedler See – Seewinkel” National Park
- Biological Station in Illmitz (~117mASL)
- Pannonian climate: Warm, dry and windy
- Soda pools, sand steppes, dry and wet grasslands, pasture, reed belt



View from station „Sandeck“ towards the wetland and the lake Neusiedl



View from station „Kirchentellinsfurth“ towards Zicklacke (soda pool)



METHODS: TRANSMITTER EFFECT



Transmitter effect:

- Flight cage experiment
- Repeated measures design: 2 specimens for 60 min. Tested with transmitter on and off (each 30 min.)
- Video analysis: Number of flights and flight duration in seconds



Flight cage (2x2x2m) setup



Wide angle camera

►•••) METHODS: POPULATION, FORAGING PLANTS, TRAITS (•••◀

Population size, foraging plants:

- Capture-Mark-Recapture (C-M-R)
- Detailed documentation of visited plants



Marked with honeybee queen plates

Individual traits:

- Body size (Inter Tegulae Distance (ITD)) and body mass (g)



Identification and individual trait assessment



METHOD: TRACKING



4 directional
antennas

Raspberry Pi

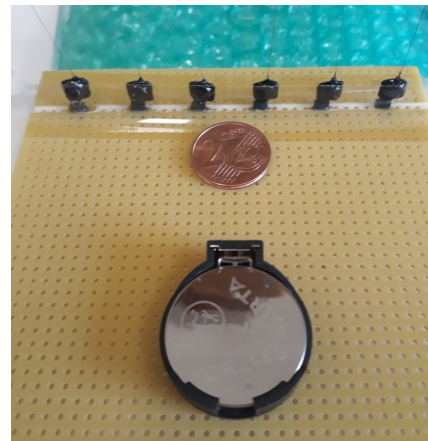
1 receiver
per antenna

WiFi modem

Photovoltaic
system
& car battery

Receiver station

- Equip specimens with very high frequency (VHF) transmitters
- Remote tracking with stationary receivers
- Hand receivers: Homing-in, transmitter recovery



0.18 g transmitters
are rechargeable



Tag application in a queen marking cage



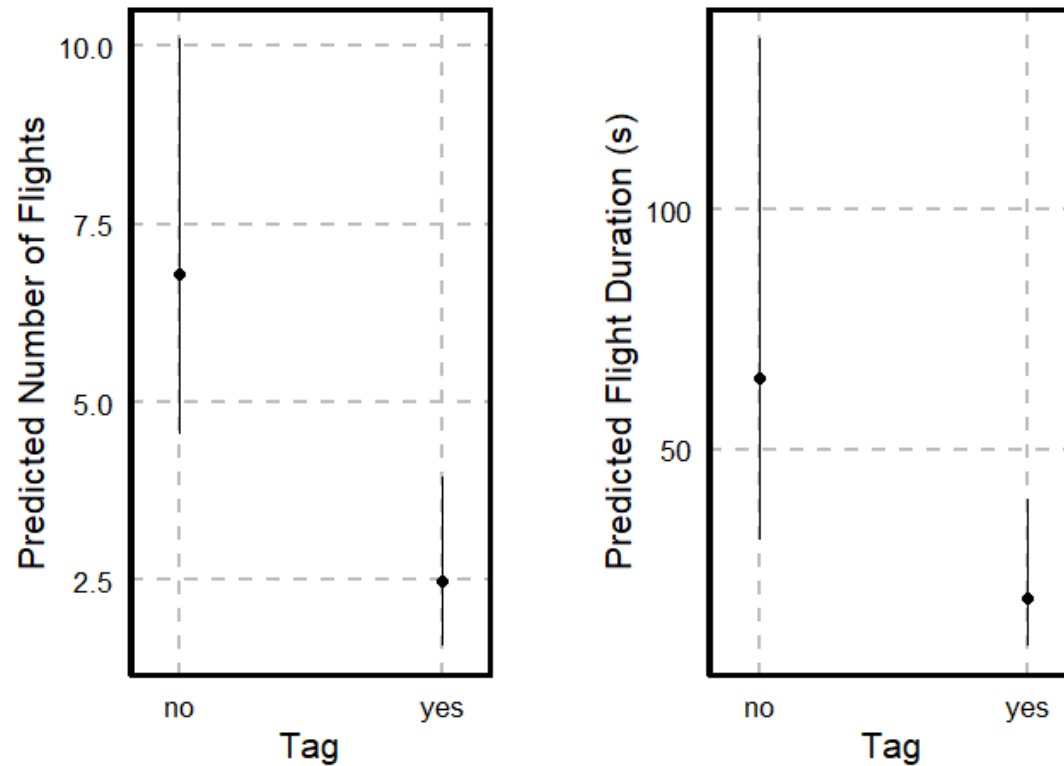
Photos: H. Wacker & S.Kratschmer



RESULTS: TRANSMITTER EFFECT



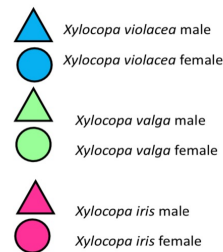
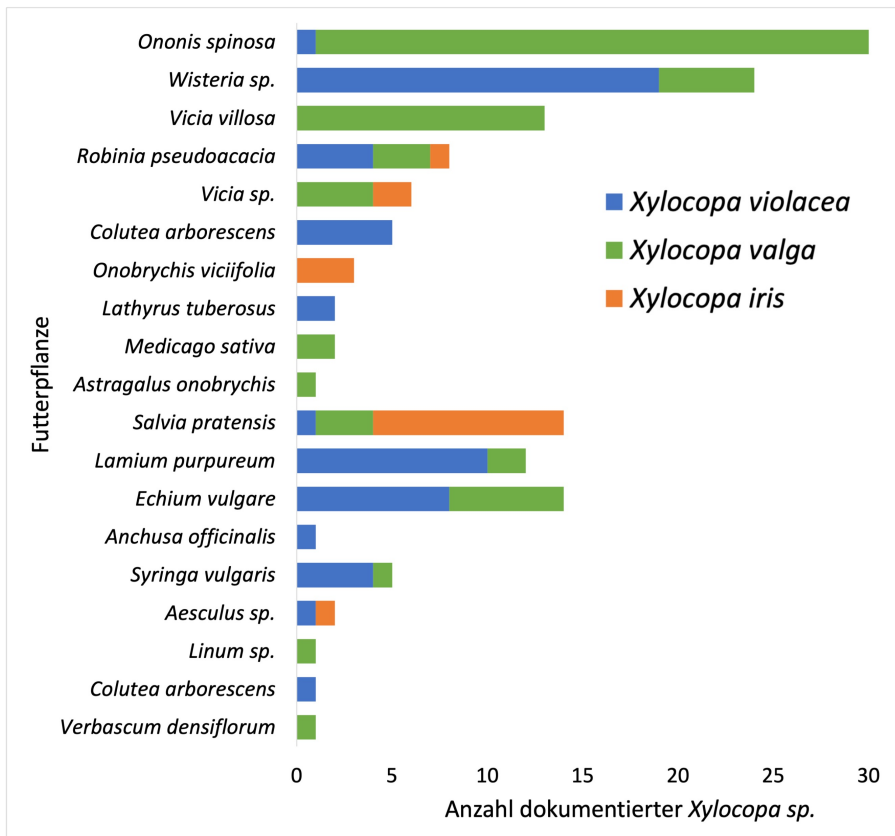
- 7 finished experiments including 14 specimens (12 ♂ and 2 ♀)
- Transmitter significantly negatively affected number and duration of flights (Poisson GLMM)



Results by V. Dönz

PRELIMINARY RESULTS: C-M-R, FORAGING ...

- 187 individuals marked, 47 recaptures





RESULTS: TRACKING



	Automated receiver stations	Manual tracking
Individuals tracked	<i>X. valga</i> : 4 ♀, 1 ♂ <i>X. violacea</i> : 2 ♀	<i>X. valga</i> : 3 ♀ <i>X. violacea</i> : 4 ♀
Tracking duration	0.75 - 47 hours (median: 5.9 hours)	0.5 - 65 hours (median: 21.5 hours)
Locations per bee	26 - 1561 (total: 3605)	1 - 7 (total: 20)
Accuracy	60 m ² (min: -249 m ² , max: 419 m ²)	0 - 25 m ²
Individuals without any location	2	

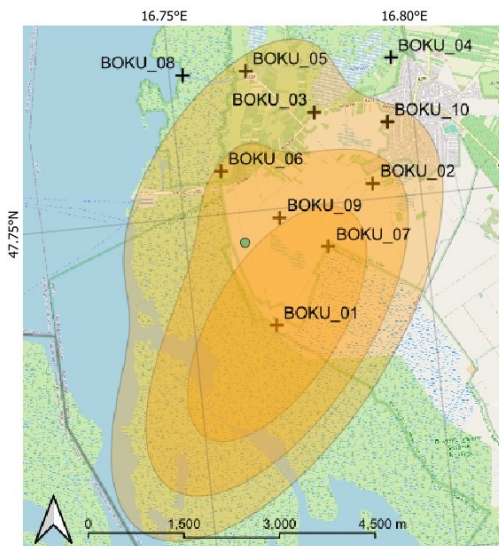
Results by H. Wacker



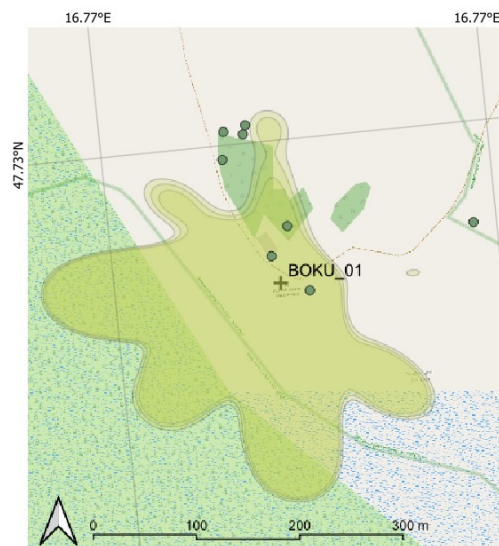
RESULTS: TRACKING



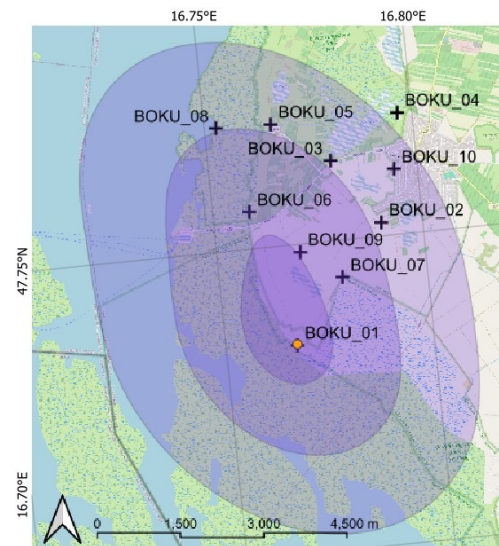
- Feasible triangulation only possible for four individuals
 - Y 37: *X. valga* ♀ on 22.06.23
 - Frequently close to woody habitats (*Robinia pseudoacacia*)
 - Activity range during 6h of tracking 15 km



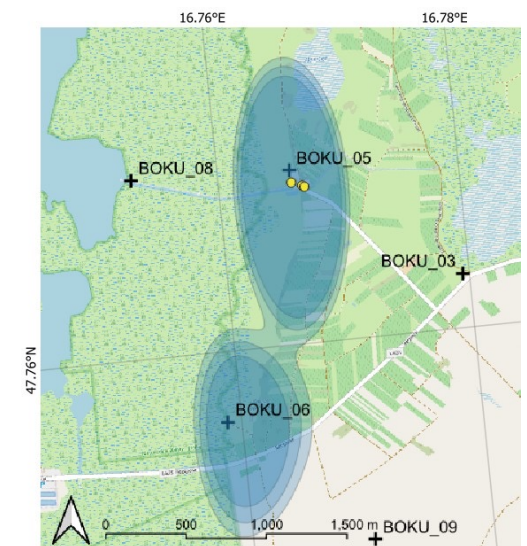
Y37 *X. valga*
15.61 km²
5.75 h



Y32 *X. valga*
0.06 km²
47 h



Y38 *X. valga*
19.1 km²
0.75 h



Y25 *X. violacea*
1.4 km²
43 h

Triangulation for *Xylocopa* sp. based on mcmc simulation



CHALLENGES



- Transmitter signals too weak <> Receiver distance too far
- Transmitters get detached and alter movement capabilities
- Specimen were quickly out of receiver range, leave study area
- High workload for trouble-shooting (Hardware!)
- Transmitter recovery time consuming with low success rate



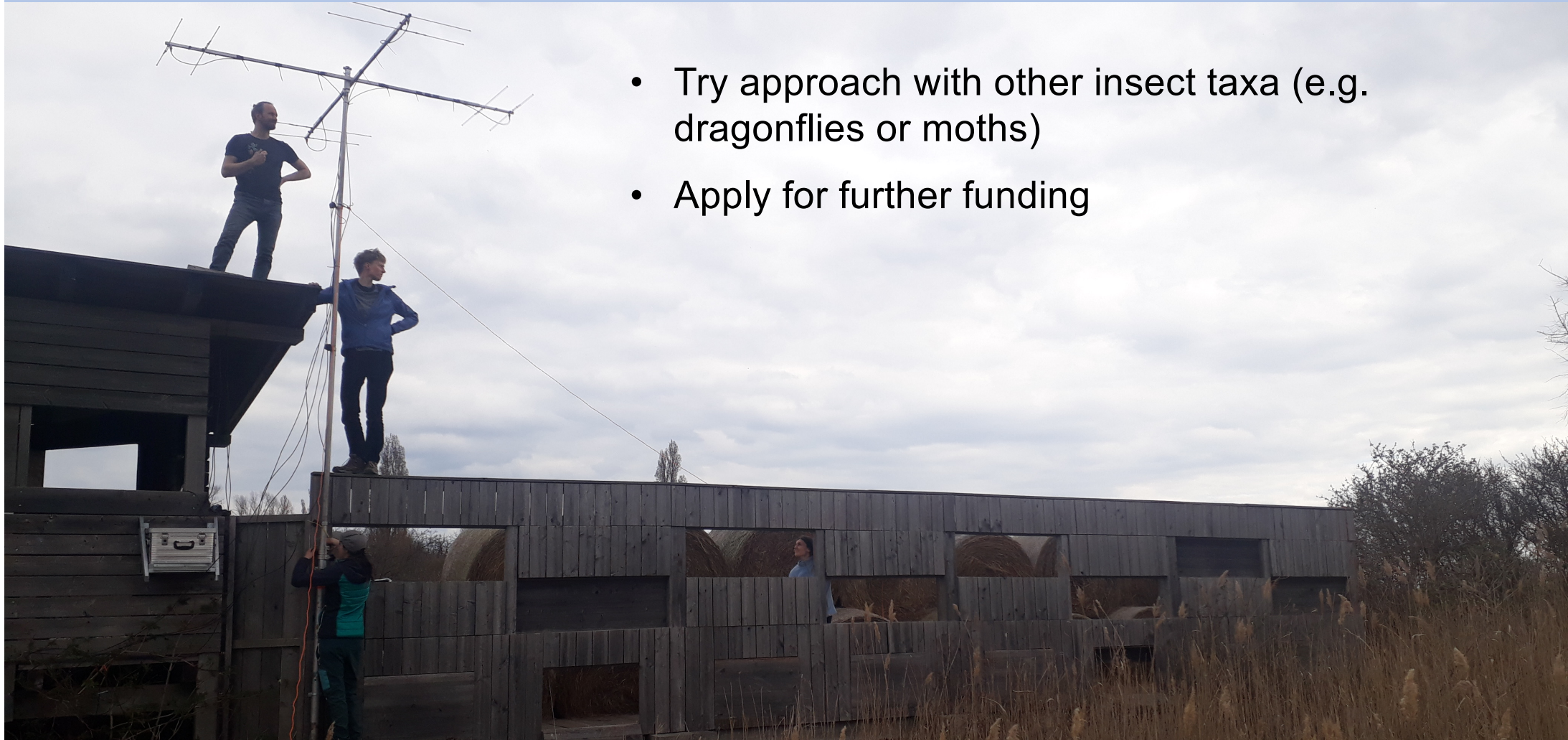
Photos: H. Wacker & S.Kratschmer



OUTLOOK



- Try approach with other insect taxa (e.g. dragonflies or moths)
- Apply for further funding





ACKNOWLEDGEMENTS



Project funding by the DIBB research stimulation 2021.

Special thanks to the Institute of Mathematics for additional funding !



Harald Grabenhofer, Arno Cimadam, Thomas Fleischhacker, Thomas Zechmeister, Bernhard Rauchwartner and Klaus Kettner for their help in the research area, during fieldwork and with handling of formalities.

We also thank Ralf Hurst (Plecotus-Solutions GmbH) for his help with technical challenges and our colleagues (Christina Rupprecht) and students (Samira, Monica, Andreas, Anna)



THANKS FOR STAYING TUNED!



Short video from 2022:



<https://www.youtube.com/watch?v=AFIKXcprxe8>



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