

# It's not a bug – it's a beetle!

## Integrating REDCap as a no-coding-needed-database in automated R Workflows to ensure data integrity and increase reproducibility

### 1 Research project

- **Goal:** Extensive green roofs as replacement habitat to maintain biodiversity in urban areas
- **Method:** Identify and count insects (e.g., beetles, bees, grasshoppers) and plants on green roofs, long-term monitoring



### 2 Challenges prior to REDCap

- MS Access as Database to store observations
- Concerns about data loss & data corruption
- Manual workflows for data import & export

### 3 User profile

- Researchers from life sciences without IT-background
- No technical skills to set up & maintain relational database
- R-programming skills available

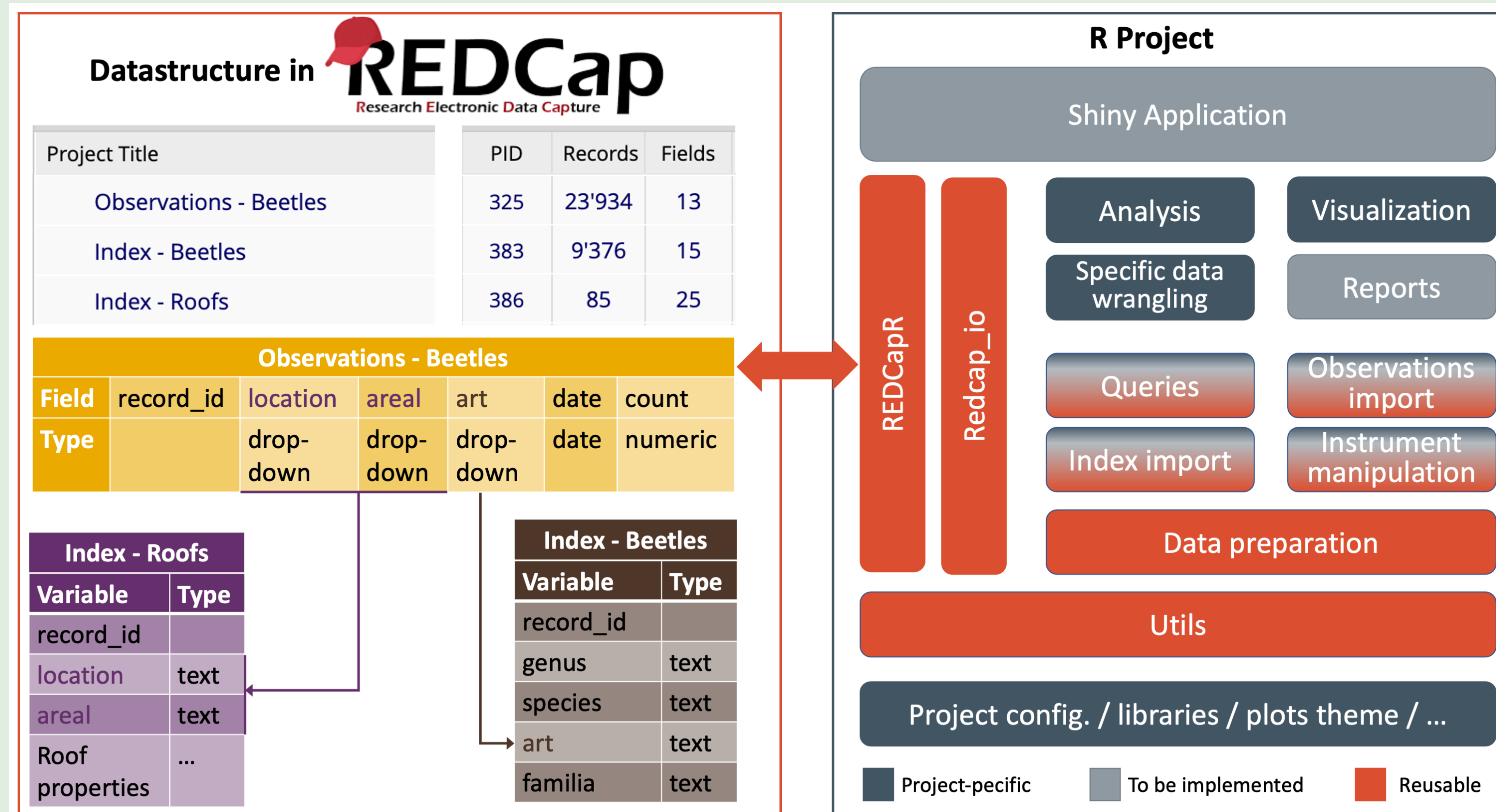
### 4 Solution

- One REDCap project per data-table
- Two REDCap projects per insect
- R-Project with functions to import/export data
- Data quality checks, e.g., check for duplicates, correct values, etc.,
- Encapsulated REDCap-interface
- Usage of the REDCap data dictionary for generalized data preparation functions
- Using R to simulate a relational database (easy join of data-frames in one line of code)

### 5 Results & Benefits

- Autonomy of researchers regarding changes of data structures
- Secure data storage with clean structure & traceability
- Automated data import & export
- No additional maintenance efforts, infrastructure, and costs for the research group
- Option of direct data input on the field
- Supporting reproducibility of research results
- Workflows & functions reusable for other projects

### REDCap/R – Architecture



### 6 Future Work

- Limitation: drop-down list with many options has slow response time
- Shiny app for Analysis and as graphical data import interface planned
- Create R-library out of R-to-REDCap-Interface functions

*'Cause not all bugs need to be solved!*

### References

- PA Harris et al. (2009) "Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support" J Biomed Inform.
- PA Harris et al. (2019) "The REDCap consortium: Building an international community of software partners", J Biomed Inform. doi: 10.1016/j.jbi.2019.103208
- H Wickham et al. (2019) "Welcome to the tidyverse." Journal of Open Source Software, 4(43), 1686. doi:10.21105/joss.01686
- W Beasley et al. (2021) "Package 'REDCapR'" <https://CRAN.R-project.org/package=REDCapR>
- S Gonsalves, O Starry, A Szallies, and Sk Brenneisen (2022). "The effect of urban green roof design on beetle biodiversity." Urban Ecosystems 25(1): 205-219

### Contact

Dr. Vanessa C. Klaas  
Zurich University of Applied Sciences  
Research & Development  
Gertrudstrasse 15  
CH-8401 Winterthur  
email: klav@zhaw.ch

### Authors

Dr. V. C. Klaas, ZHAW, President's Office, Research & Development Unit, Services Research Data  
Dr. F. Opitz, ZHAW, Life Sciences, Institute of Natural Resource Sciences, Urban Ecosystems  
Dr. M. Jaekel, ZHAW, President's Office, Research & Development Unit