

Synthesised database of wild bee and hoverfly records in Europe

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INTRODUCTION AND DATA PIPELINE

Wild bees and hoverflies are among the **most important pollinators** in Europe. Both groups are **highly threatened** and have experienced a sharp decline in recent decades due to habitat loss, pesticide use, and climate change. Assessing and reversing these trends requires **large, reliable, and standardized occurrence datasets**, which have long remained scarce due to dispersed sources and inconsistent data quality. To address this gap, we compiled and harmonized records from taxonomists, museum collections, citizen-science platforms, and previous European projects – including new data collected for data-deficient countries. All records were standardized following the Darwin Core standard and **validated by national and international expert taxonomists**.

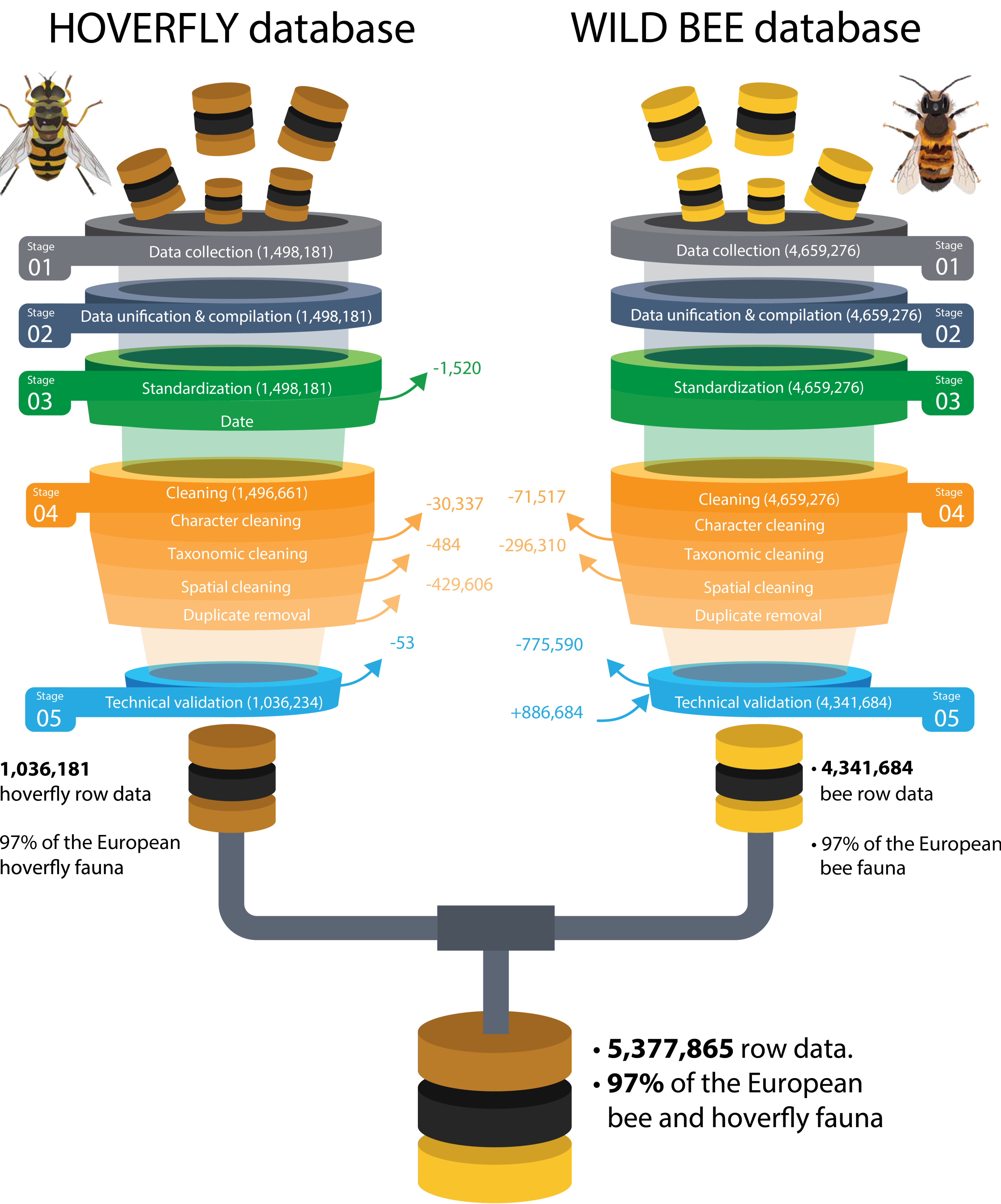
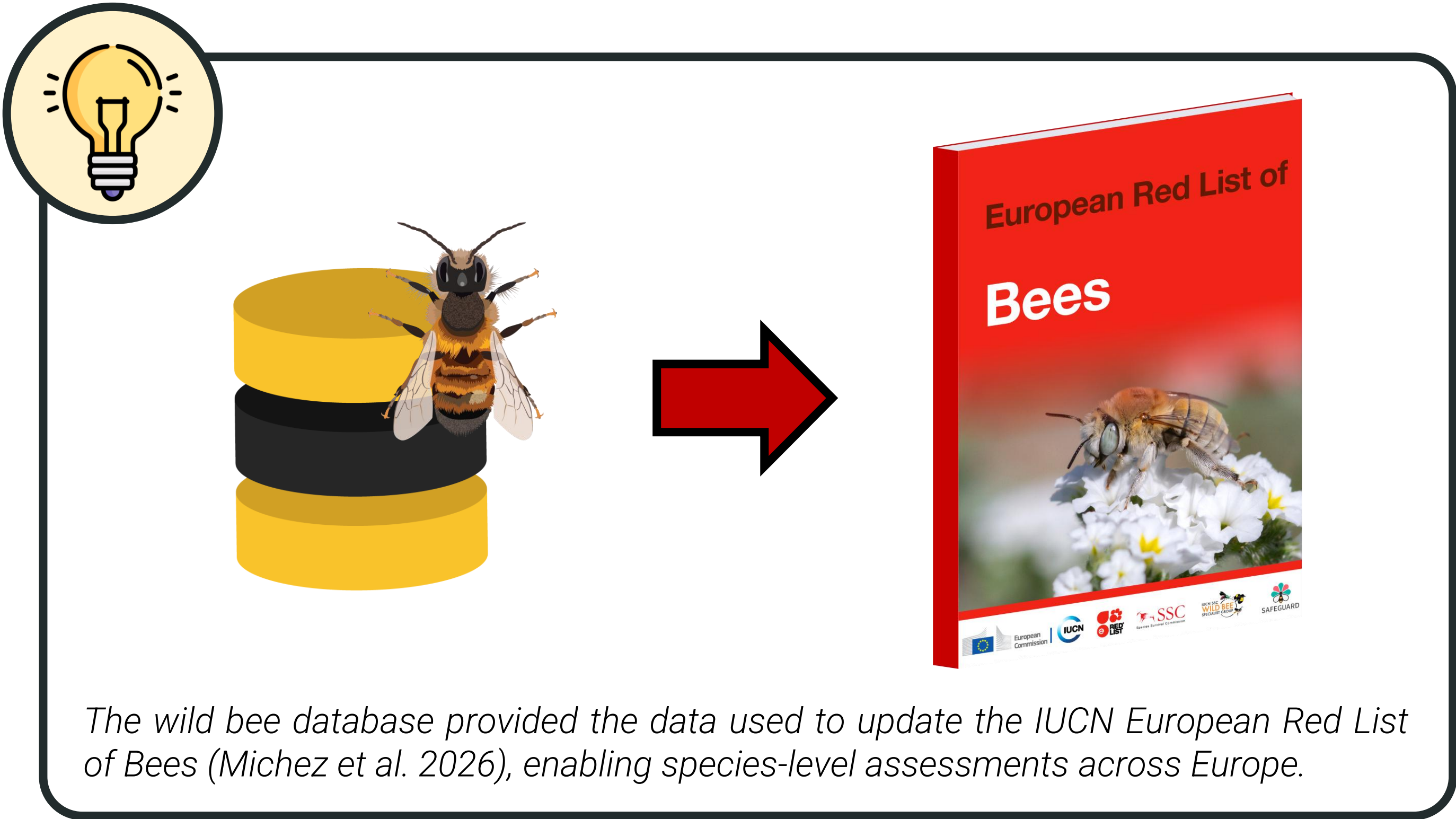


Figure 1. Summary of the data processing procedure for bee and hoverfly databases, including a description of the steps from data collection to technical validation. The numbers in brackets indicate the raw data at each step, and those outside the funnels indicate data that was deleted ("-") or added ("+").



TAXONOMIC COMPOSITION

Figure 2. Taxonomic composition of the databases, showing the proportion of European species (ring charts) and the proportion of observations (pie charts) by subfamily (hoverflies) or tribe (bees). The numbers in the pie charts correspond to: 1 = Melittidae, 2 = Other Megachilidae, 3 = Sphecodini, 4 = Other Halictidae, 5 = Other Andrenidae.

SPECIES COVERAGE AND OCCURRENCE DISTRIBUTION

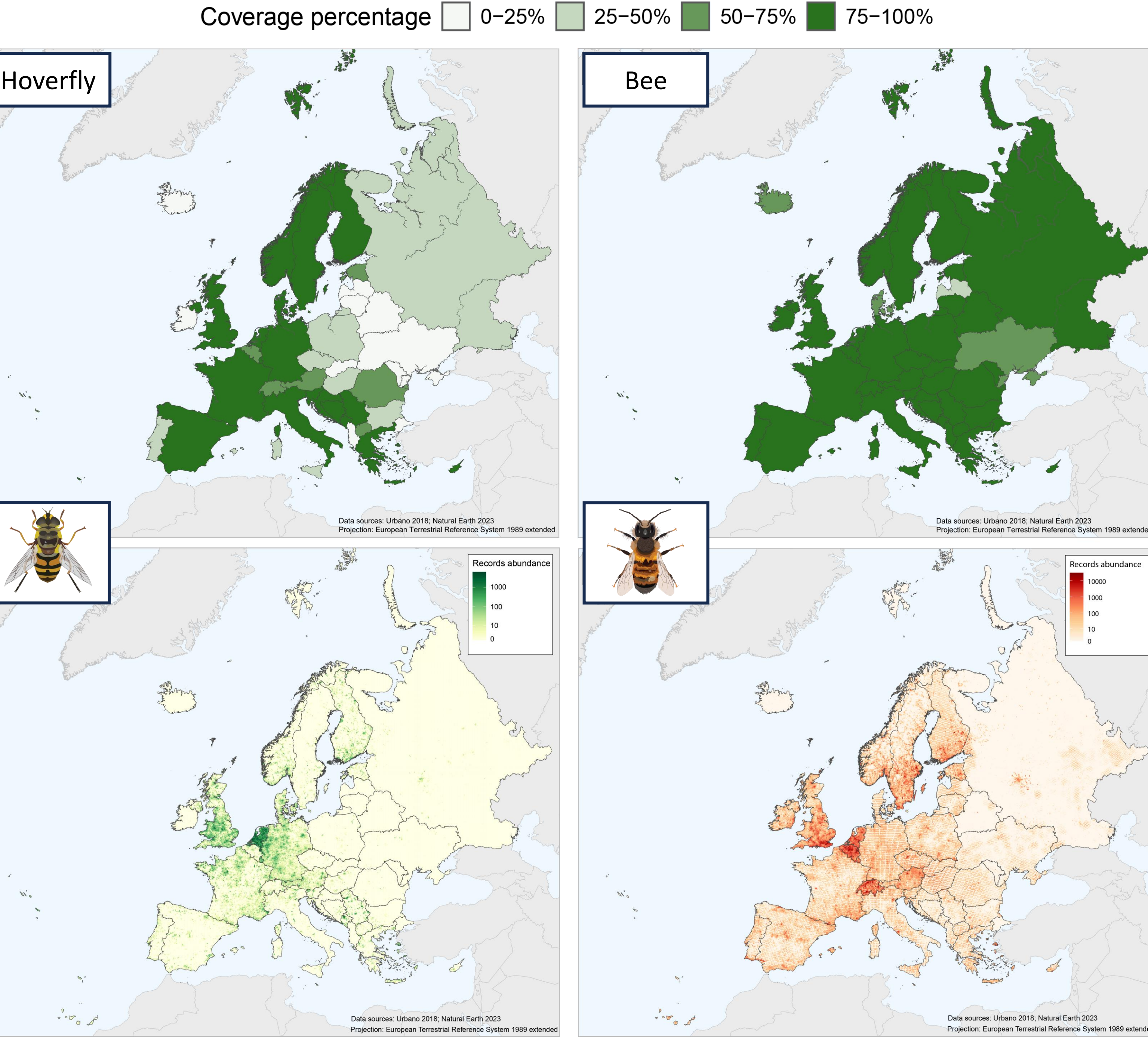


Figure 3. Coverage of hoverfly and bee species by country, compared to national checklists (top), and a map of Europe illustrating the spatial distribution of data for both groups at a 10-km grid resolution (bottom). The intensity of the color indicates the proportion of species recorded in the database and the observed abundance.

CONCLUSION

- ✓ **5.37 million records** covering 97% of the European bee and hoverfly fauna
- ✓ **First expert-validated**, harmonized, Darwin Core standardized database at European scale
- ✓ Core resource for the IUCN **European Red List of Bees 2026**
- ✓ **Essential resource for future research**, monitoring and conservation of wild pollinators

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