

ARE SOLITARY BEES ADAPTING TO ENVIRONMENTAL CHALLENGES?

A GENOMIC INVESTIGATION

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BACKGROUND

- **Knowledge gaps** for threatened pollinator species, including solitary bees. (Souther et al., 2024)
- **Lack of population genomic studies** for solitary bee species. (Santos et al., 2025; Zayed & Packer, 2007)
- Solitary bees potentially **more vulnerable** than social species. (Straub et al., 2015)

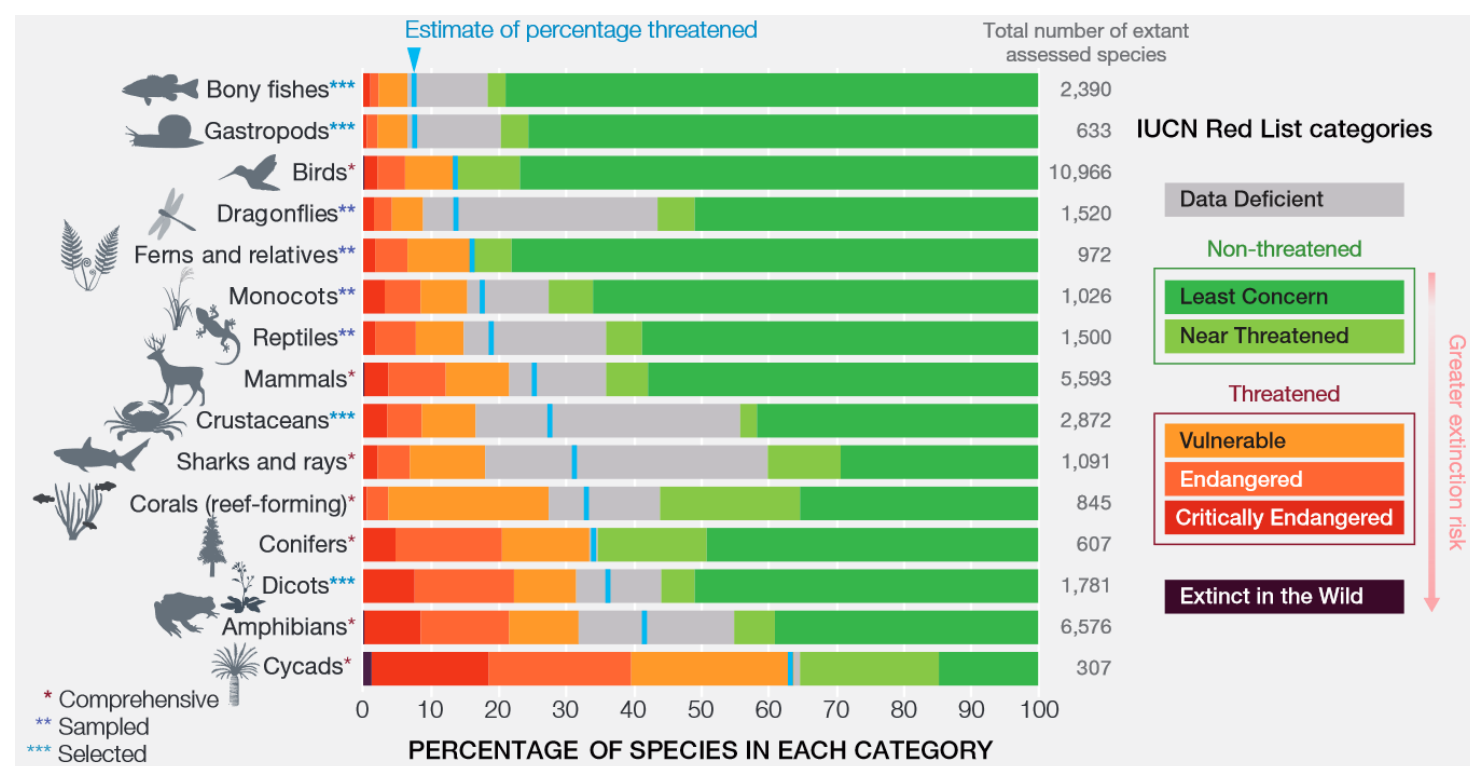


Fig. 1: Current global extinction risk in different species groups. (IPBES, 2019)

genomic resources

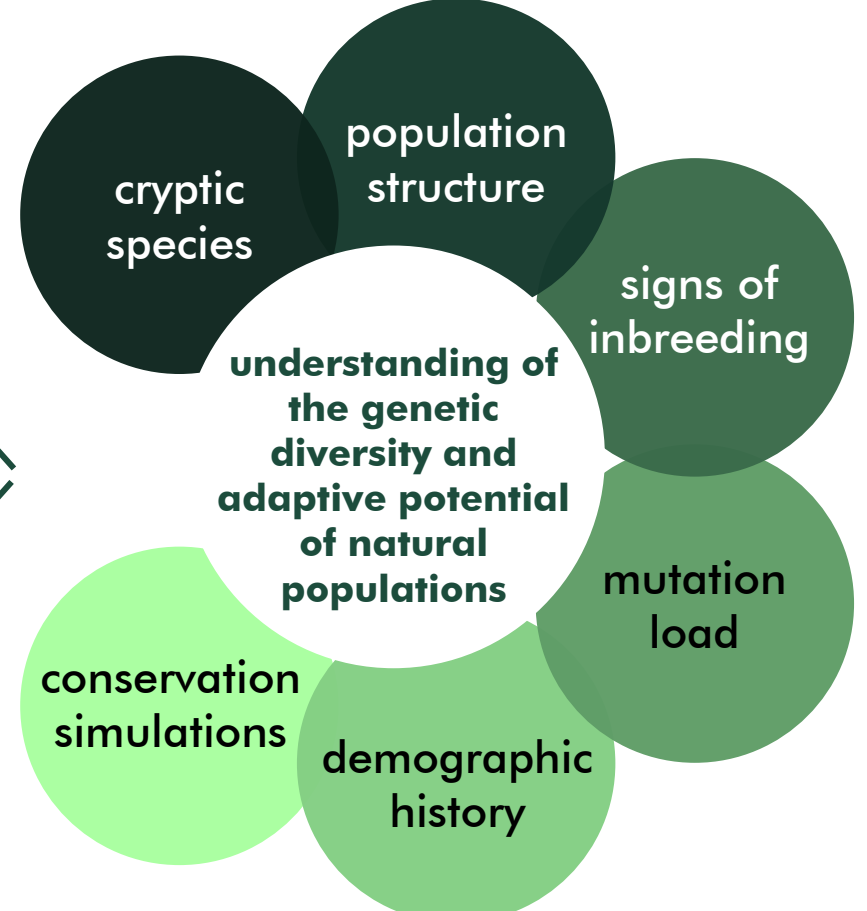


Fig. 2: Applications of conservation genomics. (adapted from: Pegueroles et al., 2024)

AIMS

01

Genomic resources

How diverse are currently available genomic resources for bees?

02

Population genomics

How genetically diverse are three representative solitary bee species in Germany?

03

Adaptive potential

How well can solitary bees adapt to current and future stressors?

04

Comparison with social species

Are there signs of reduced selection in solitary bees compared to social bees?

PRELIMINARY RESULTS: AIM 01

- Data obtained from the NCBI **Sequence Read Archive (SRA)** database.
- Retrieval of associated **metadata** (e.g., sequence type, upload date).
- **Representation of species** present in this database assessed using **community ecology metrics** (species richness, diversity, evenness).
- **Bees consistently rank lower than other pollinators** in terms of diversity of represented species. **Few bee species** are currently well represented.

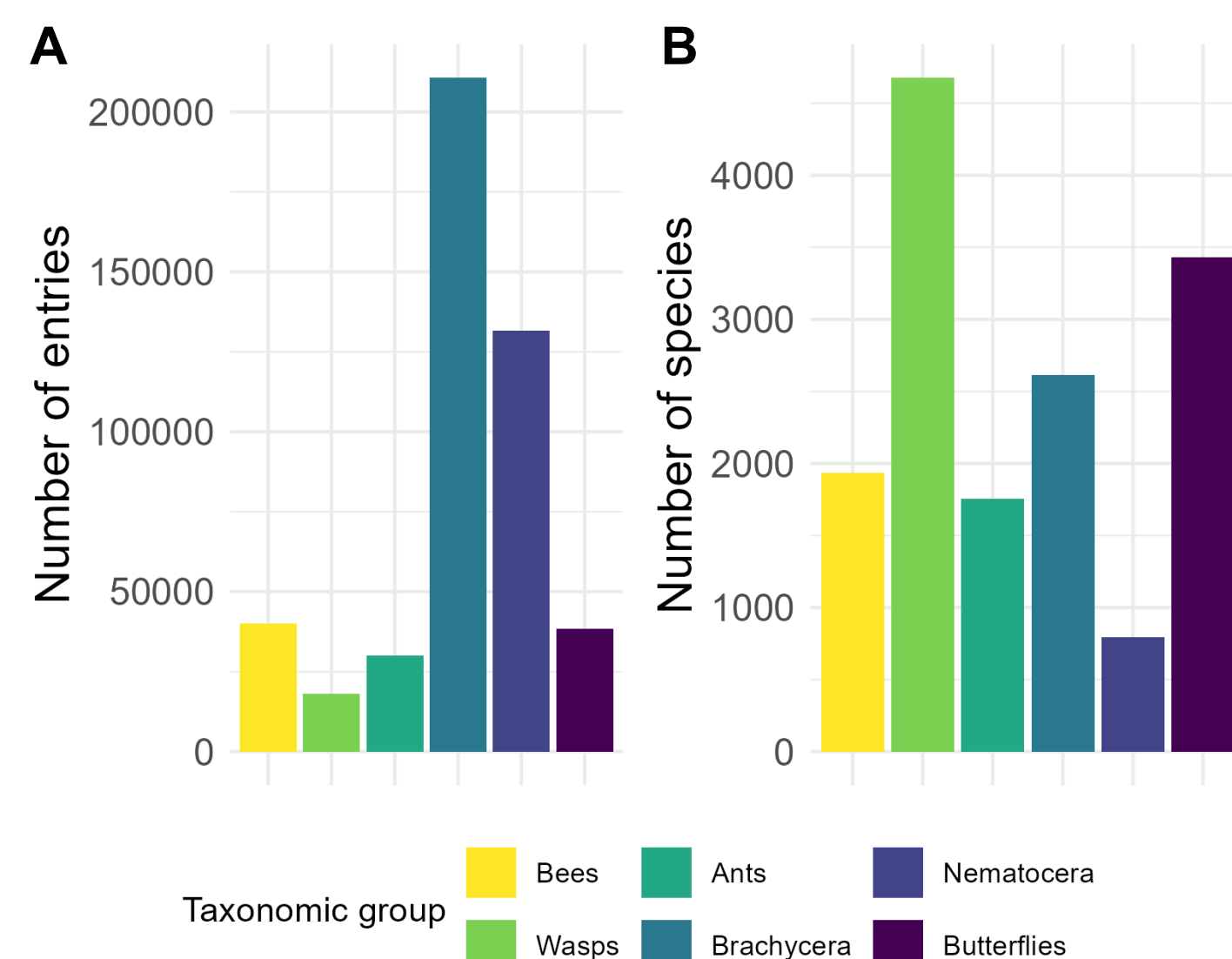


Fig. 3: (A) Flies have the most entries, but (B) wasps have the highest number of unique species represented in the SRA database.

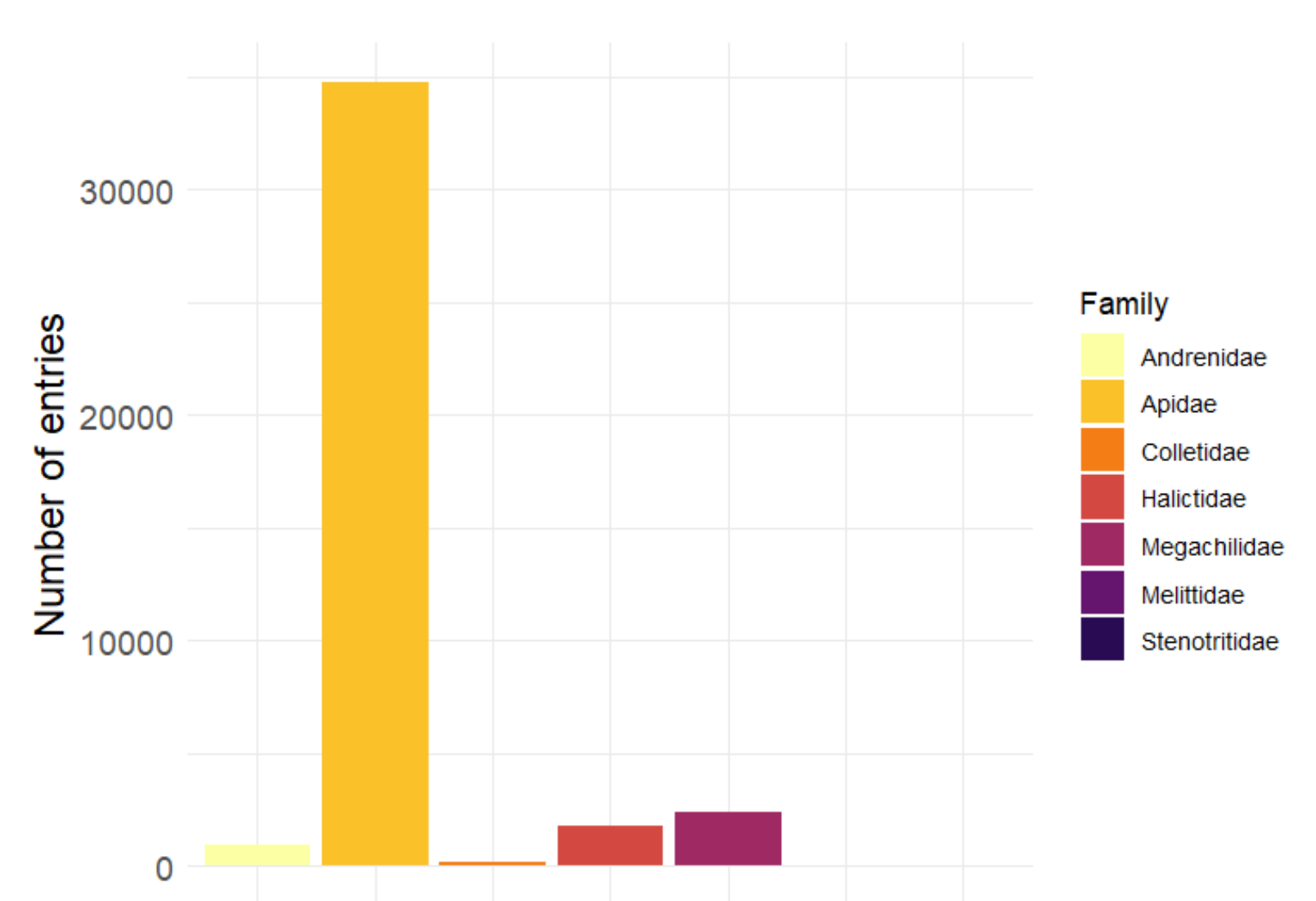


Fig. 4: Apidae account for 34,755 (86.84%) entries of all currently available data for bees within the SRA database.

ONGOING WORK: AIMS 02-04

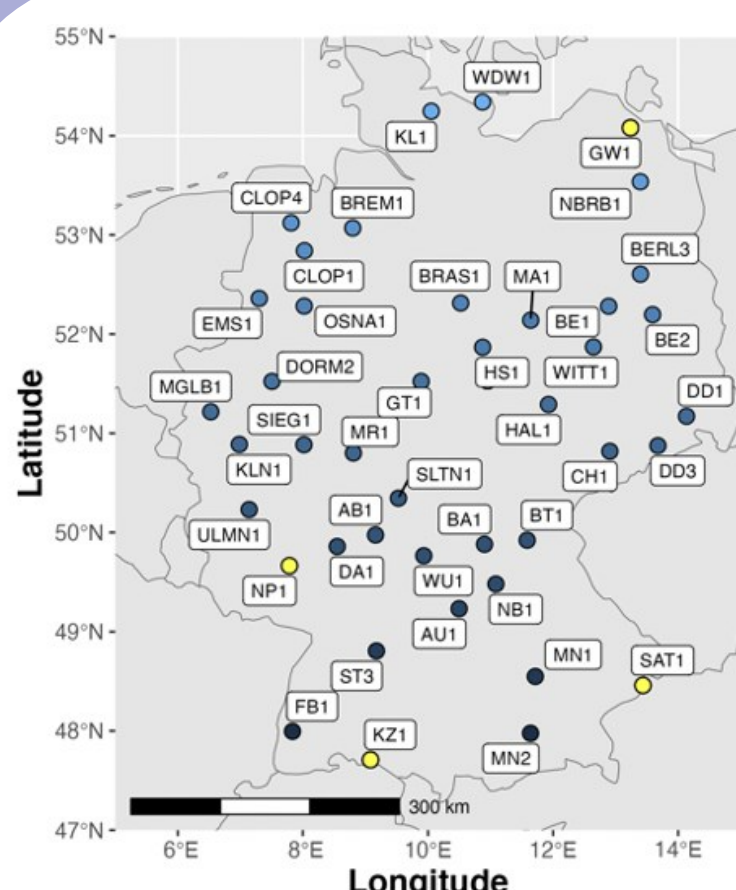
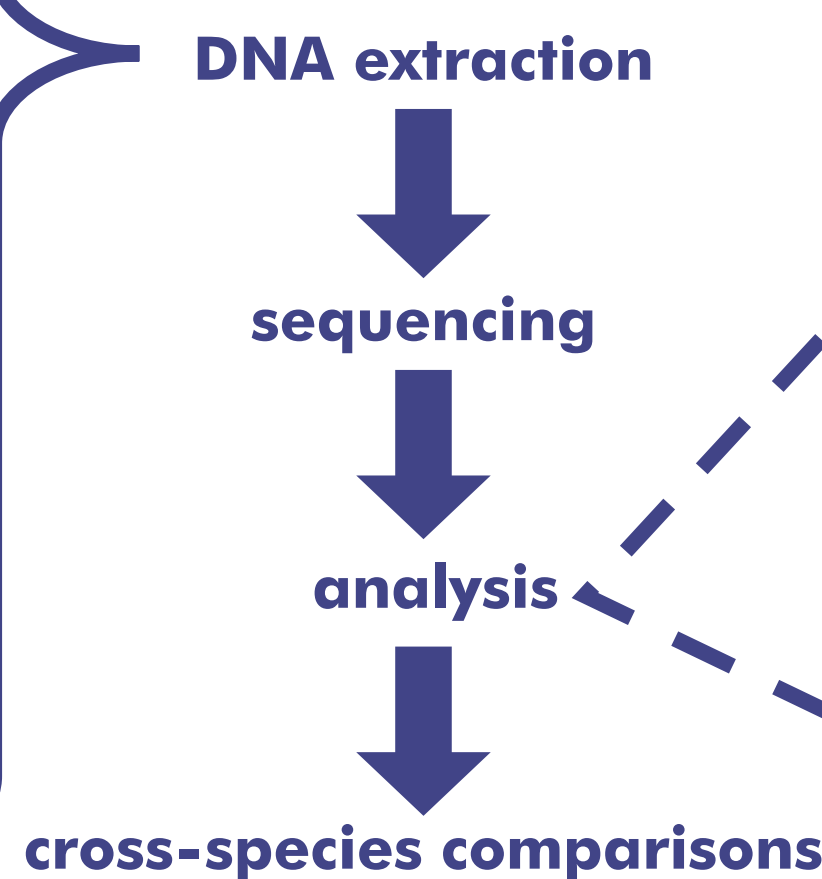
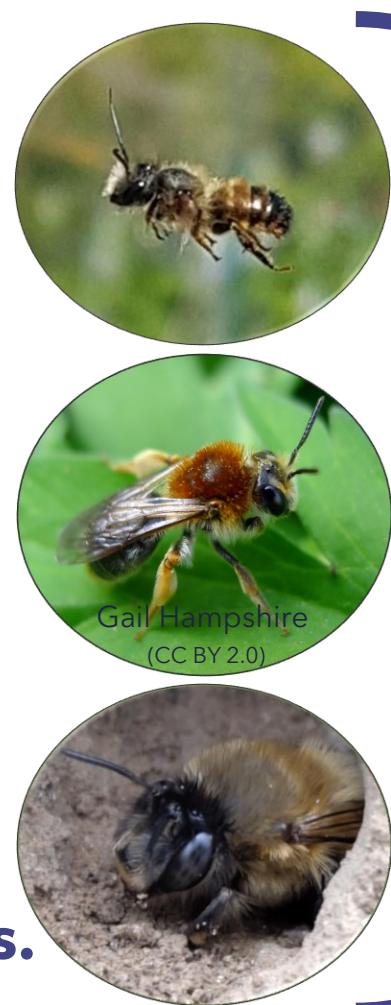
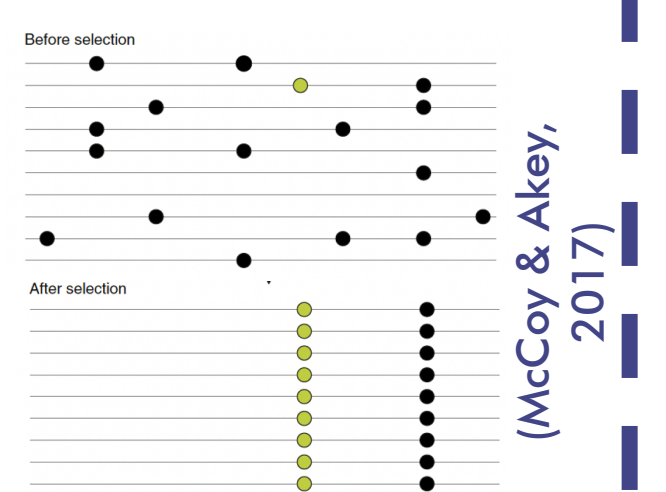


Fig. 5: Sampling locations. (Jannik Möllmann, *Osmia* spp.)



genome-wide analyses

- nucleotide diversity
- population structure
- signatures of selection (selective sweeps)



- immune genes (Larragy et al., 2023)
- detoxification genes (Haas et al., 2023)

