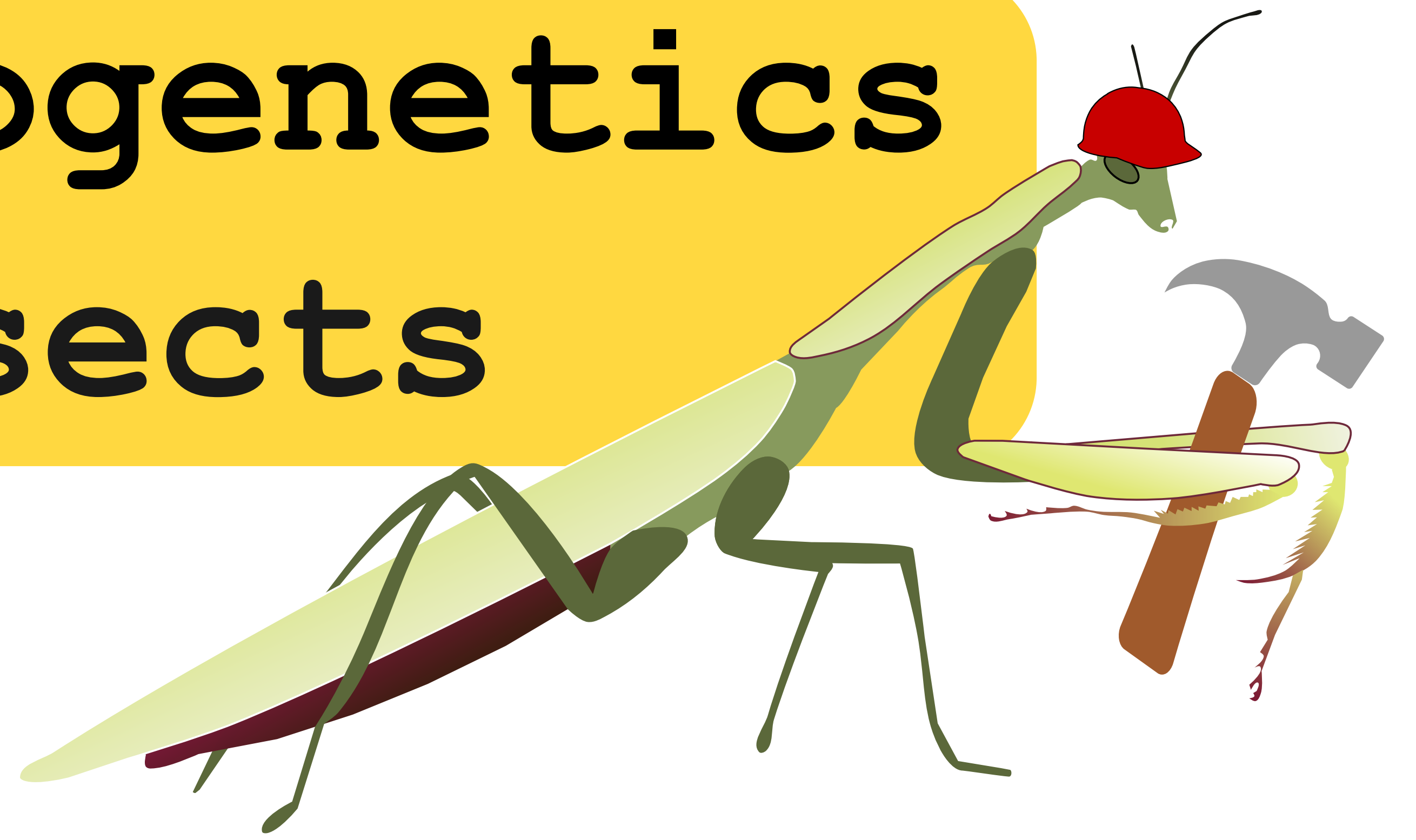


Building a macrogenetics database for insects



Emily Dovydaitis, Michael Gerth, Chloé Schmidt

Background

- Genetic diversity is a key component of biodiversity
- Populations depend on genetic diversity to cope with environmental and human-driven changes
- Understanding how population genetics covary with the environment helps us understand biodiversity patterns

Knowledge gap

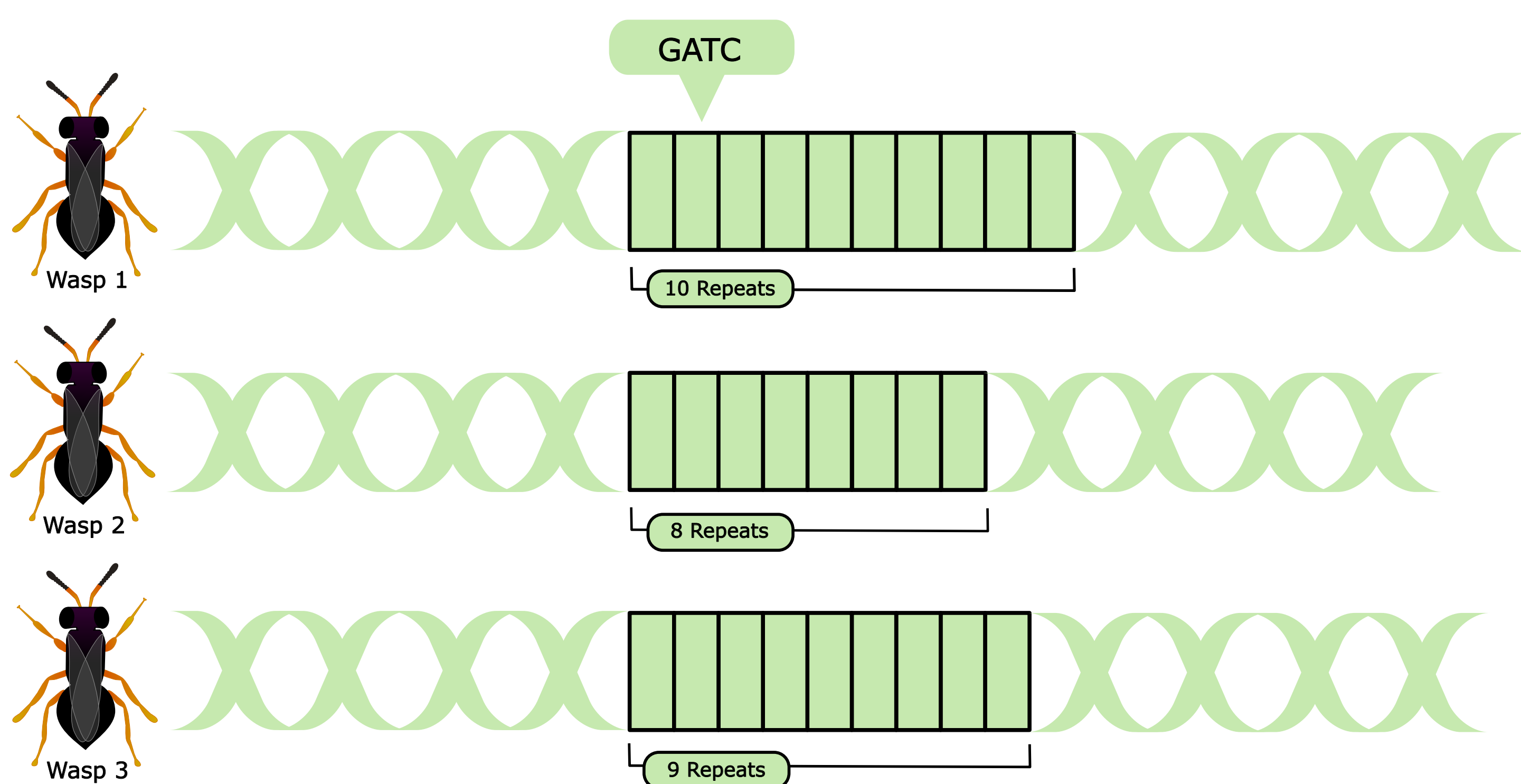
Invertebrates account for ~80% of all animal species

We know little about:

- broad scale spatial distribution of insect genetic diversity across species
- how genetic diversity patterns covary with environments, population structure, dispersal ability, and human-caused environmental change

Issue: There is no nuclear DNA, population genetics database for invertebrates

Solution: Help construct the MMPop! population genetics database by adding insect microsatellite genotypes



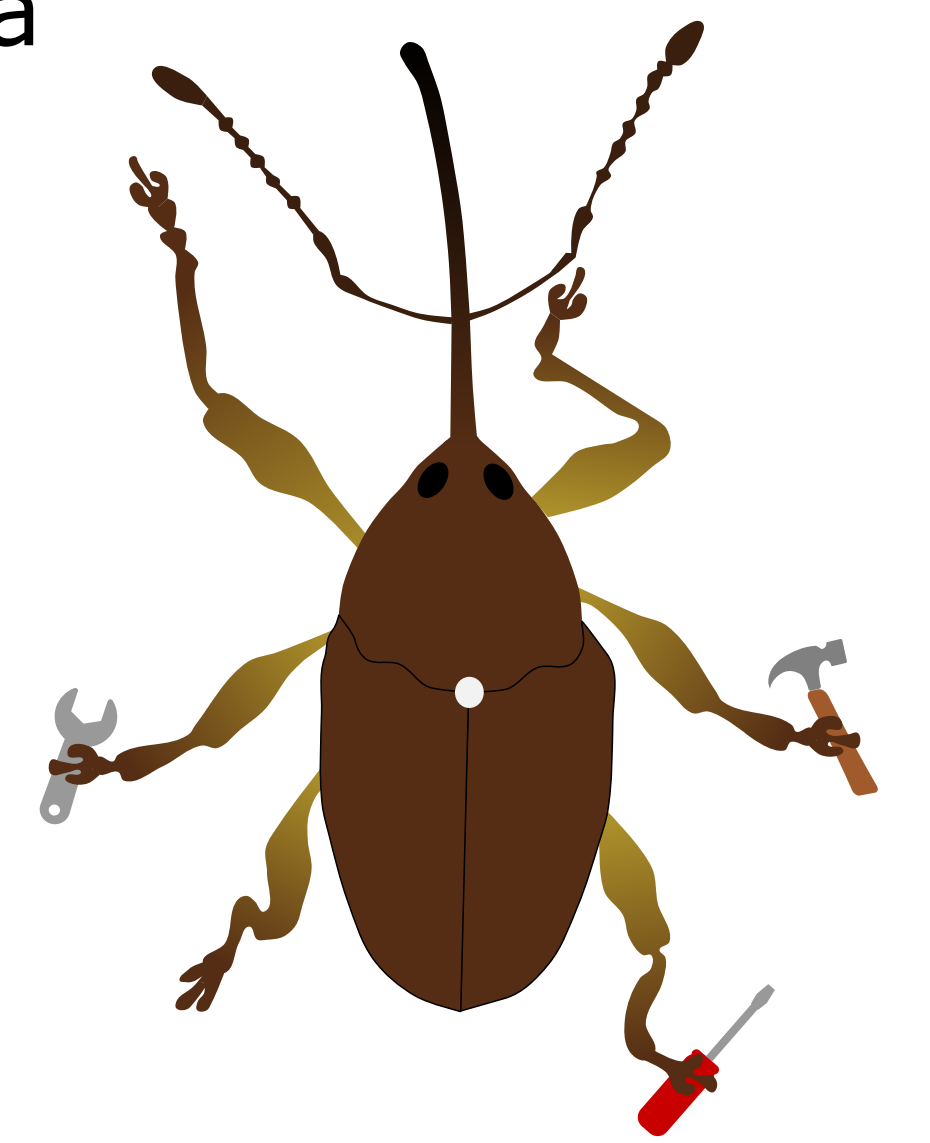
Microsatellites
aka short tandem repeats

Macrogenetics

synthesizes publicly available data to study population genetics questions at broad spatial and taxonomic scales

Building a database

1. Create a list of 50,000+ insect genera and common names
2. Query the Dryad data repository for microsatellite genotypes
3. Select datasets to include based on a priori inclusion criteria
4. Standardize genotype data
5. Add population level metadata, such as geographic coordinates, ploidy, and invasive status



Analysis steps

- Calculate genetic diversity values:
 - gene diversity
 - allelic richness
 - fixation index (FST)
 - effective population size (N_e)
- Extract values from raster data
 - human population density
 - human footprint
 - climate
- Run mixed-effects models

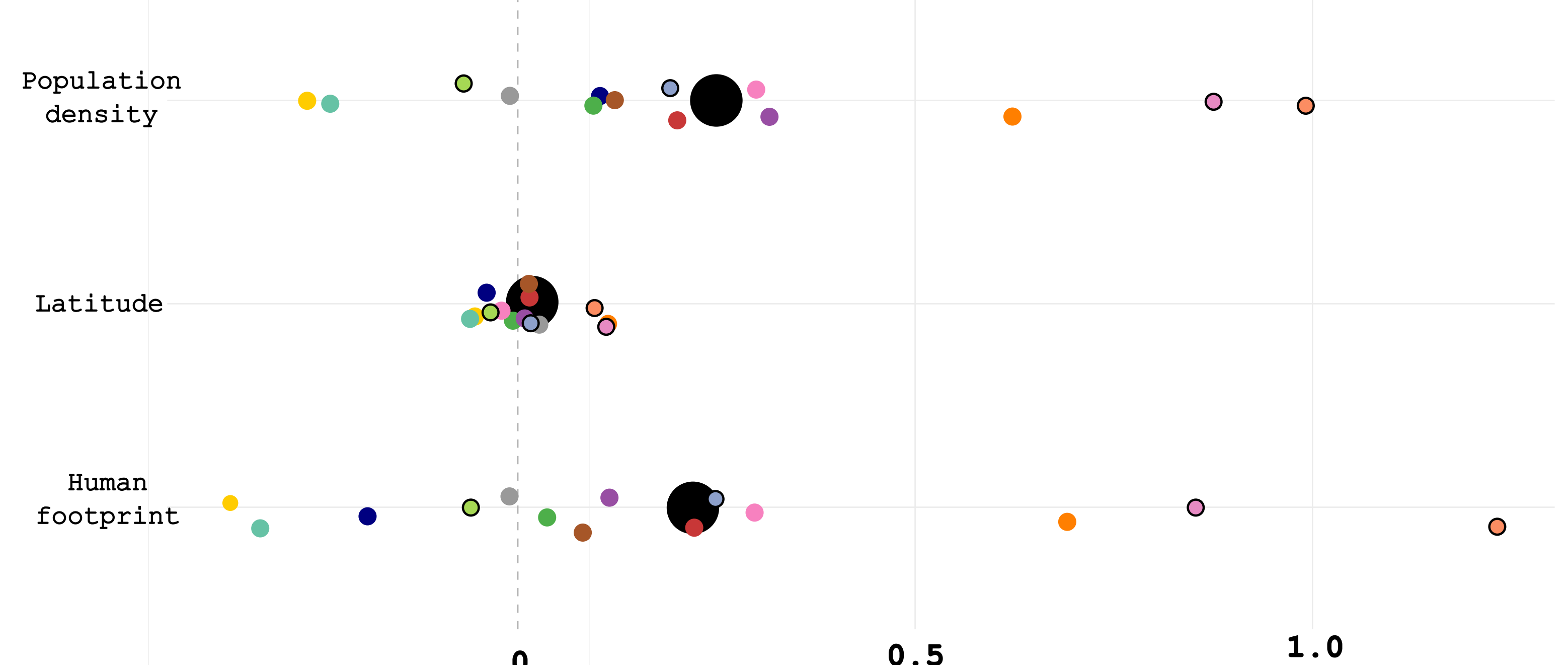


Under construction: future uses of the database

Using the database, we can answer questions such as:

- Why does the genetic diversity of some species have a positive relationship and others a negative relationship with human footprint? With population density?
- Does genetic diversity, like species diversity, increase at lower latitudes?
- How does genetic diversity covary with climate?

Gene diversity coefficient plot: *Bombus*



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