

Identification of the complementary sex determination (CSD) locus in *Lysiphlebus fabarum*

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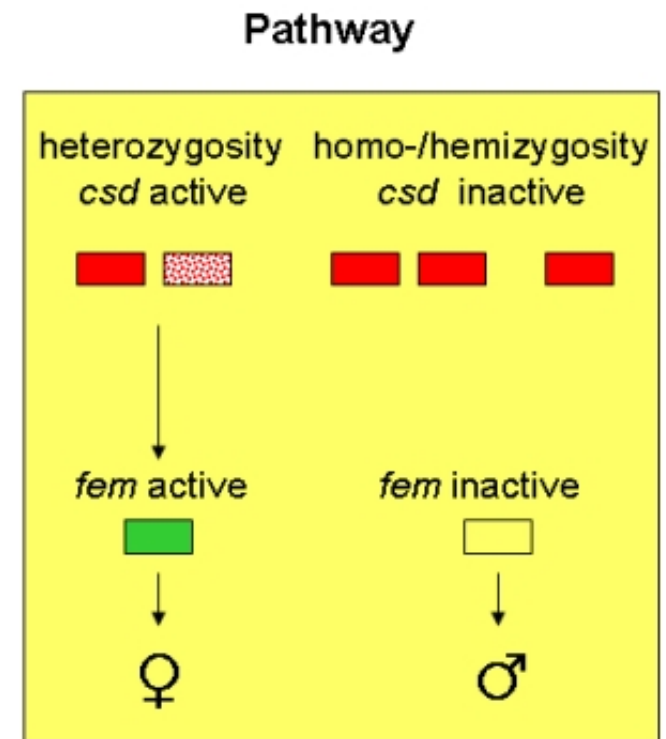
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Lysiphlebus fabarum © INRA, Bernard Chaubet

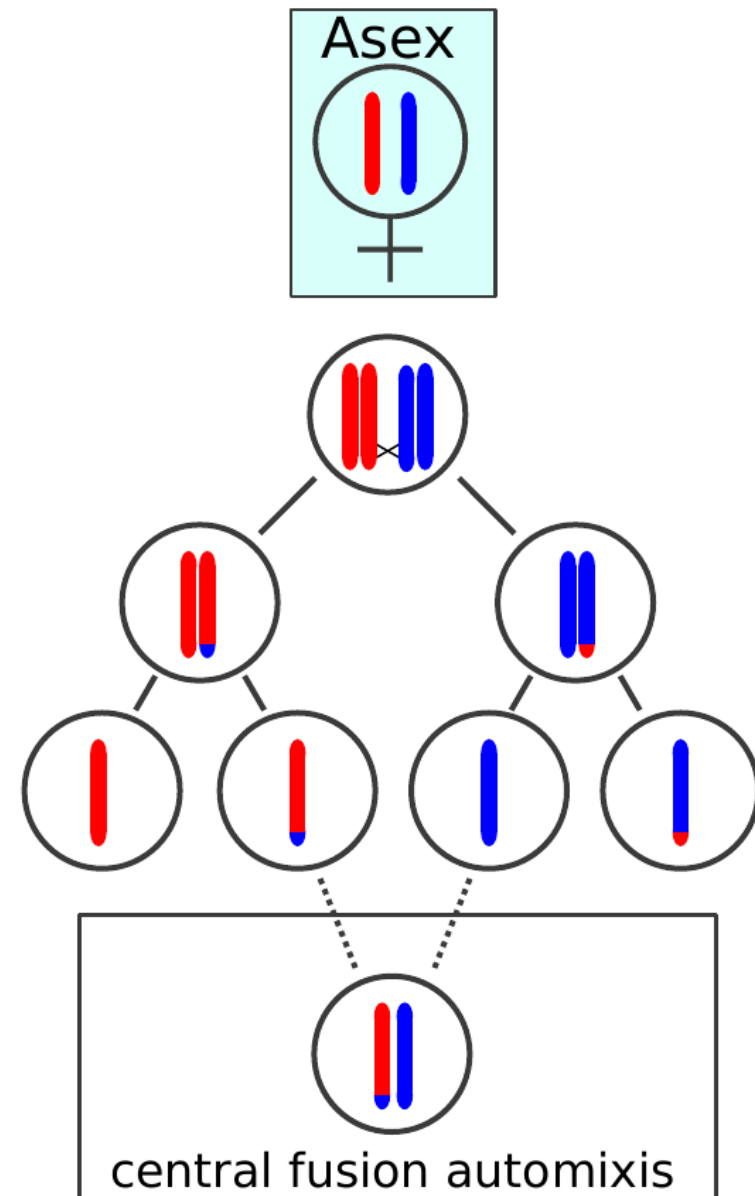
CSD mechanism

- 2 different alleles required to trigger female development
- Males are normally haploid: single copy
- Diploid individuals with homozygous CSD develop into males
- Can be single or multi-locus CSD



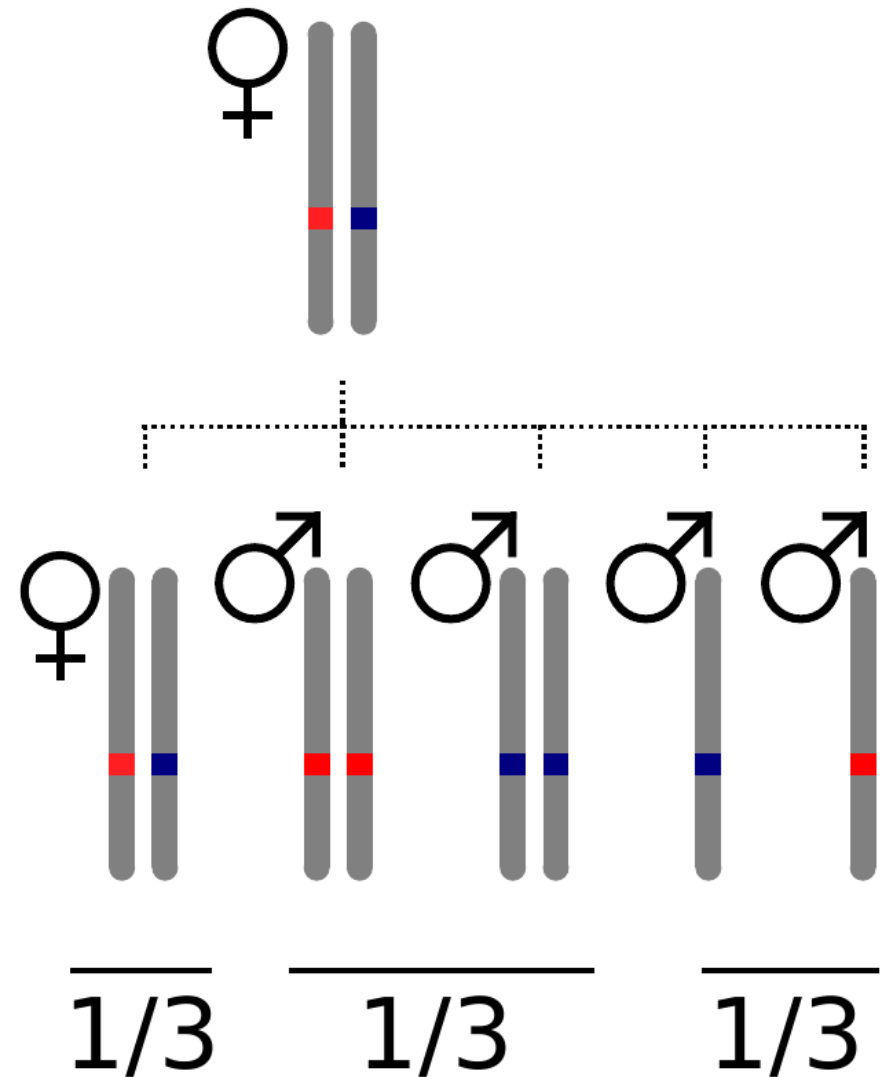
L.fabarum : Introduction

- Sex and asex populations
- Central fusion automixis: recombination
- Thelytoky: recessively inherited from a single locus
- Multi-locus or single-locus *csd* ?



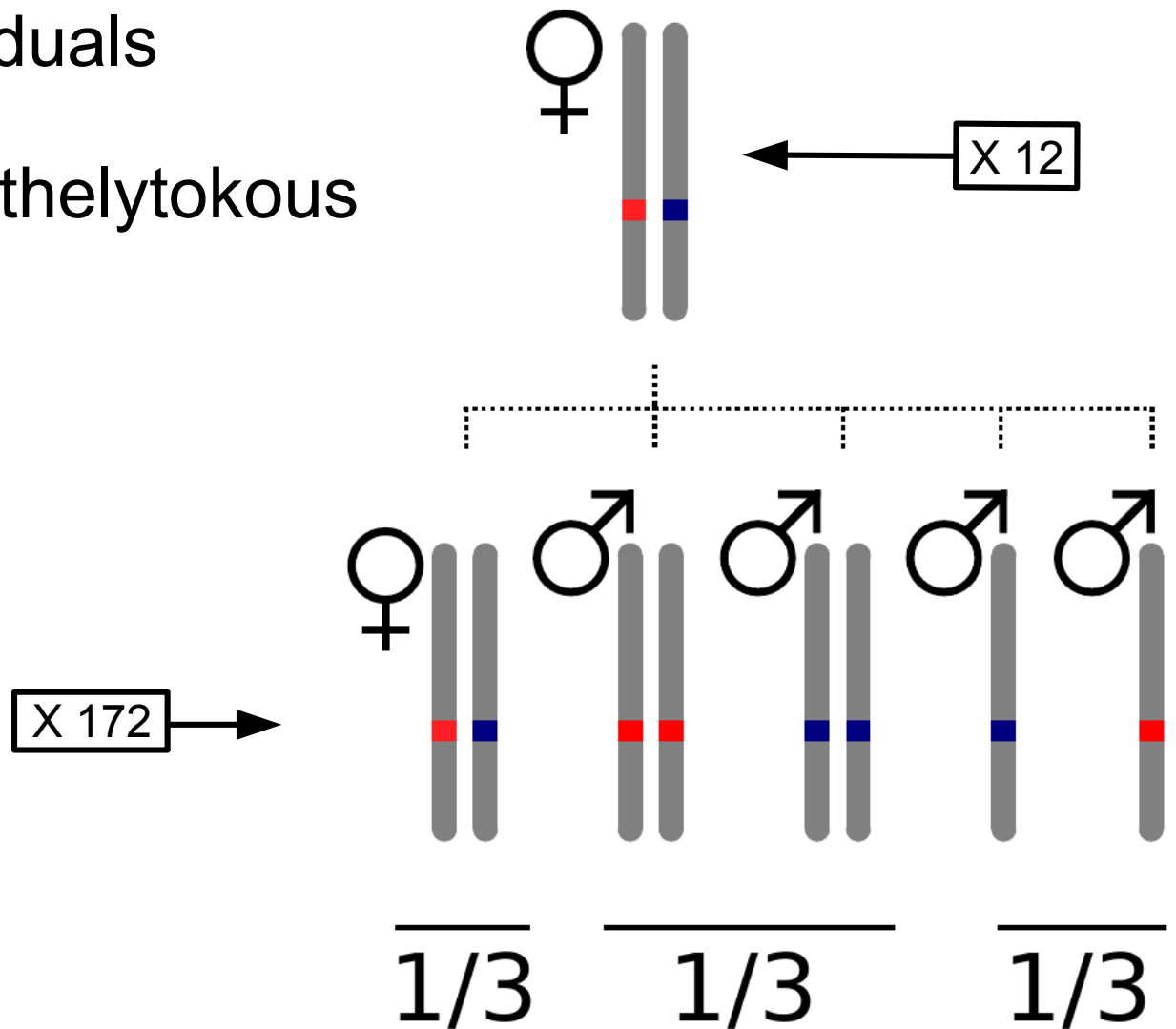
Crossed individuals

- Thelytokous females
- Strongly inbred
 - High rate of diploid males production
 - Highly homozygous background



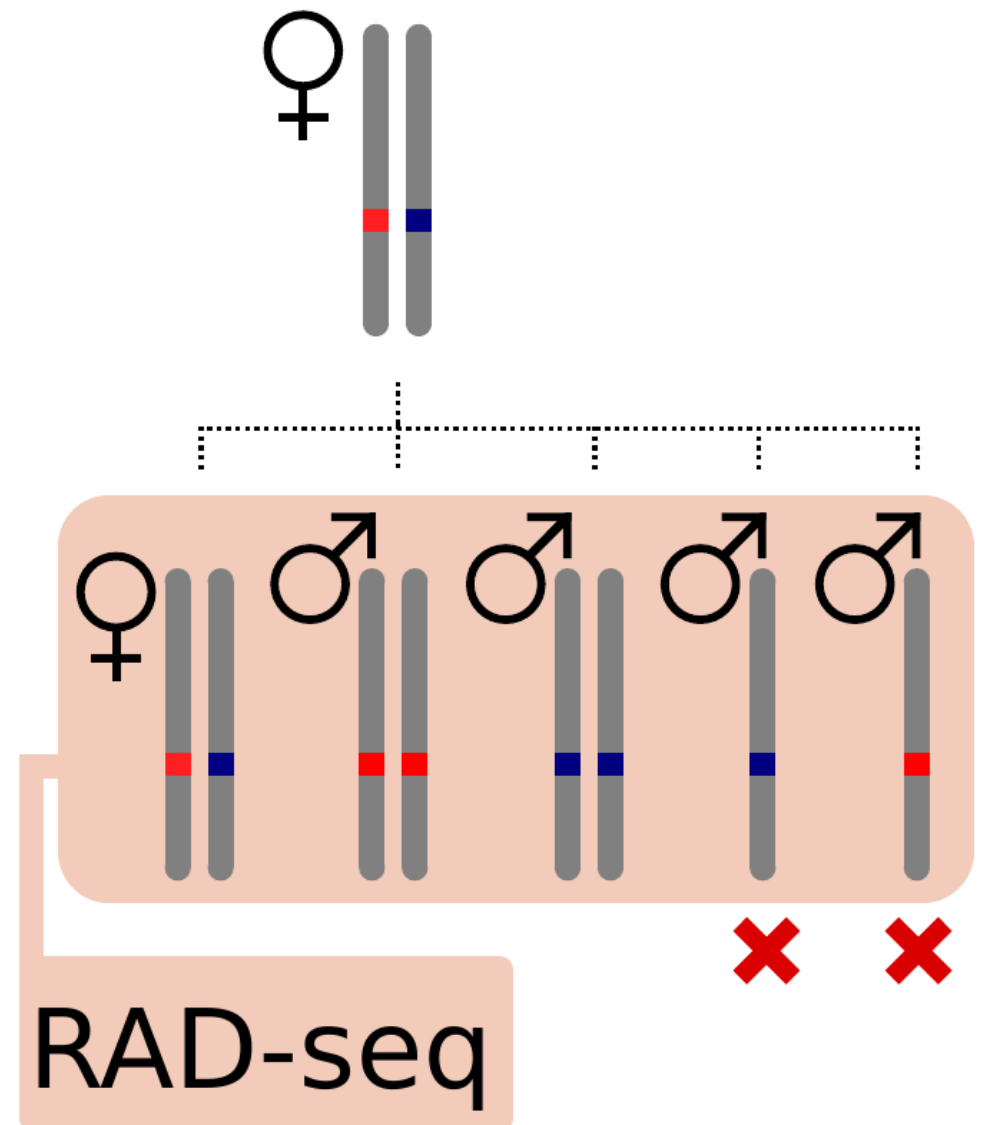
Crossed individuals

- Total of 172 individuals
- From 12 different thelytokous mothers



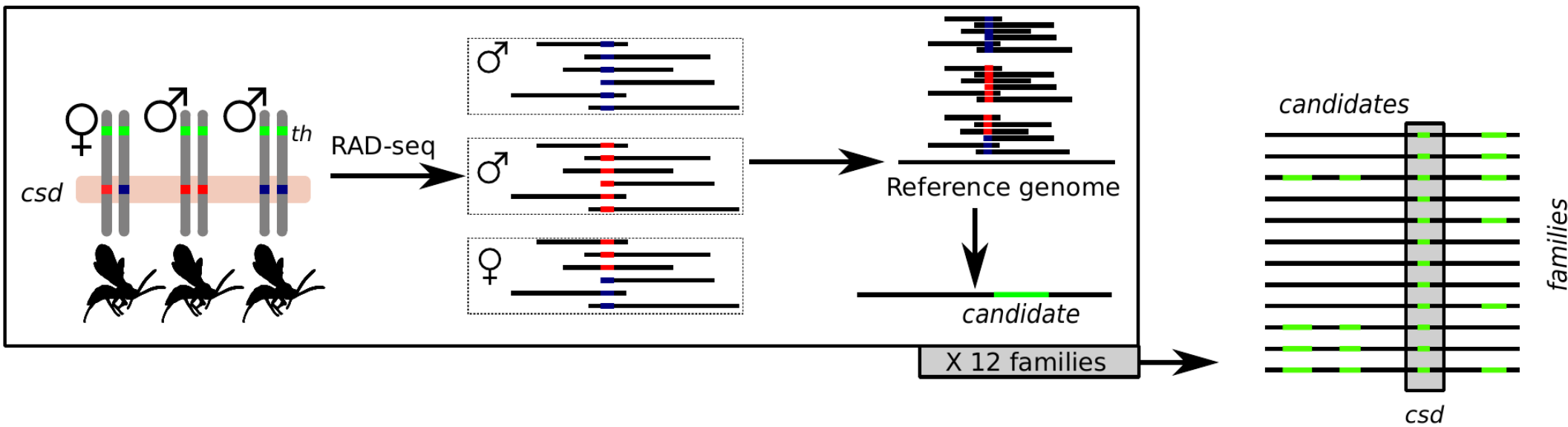
Crossed individuals

- Different allelic combinations of CSD
- Haploid males: useless



Design

- ✓ 172 wasps RAD-seq'ued
- 1. Exclude haploid males: homozygosity levels
- 2. Build catalogue of loci (reference genome available !)
- 3. Identify candidate loci in each family using SNPs
- 4. Filter common candidate across all families

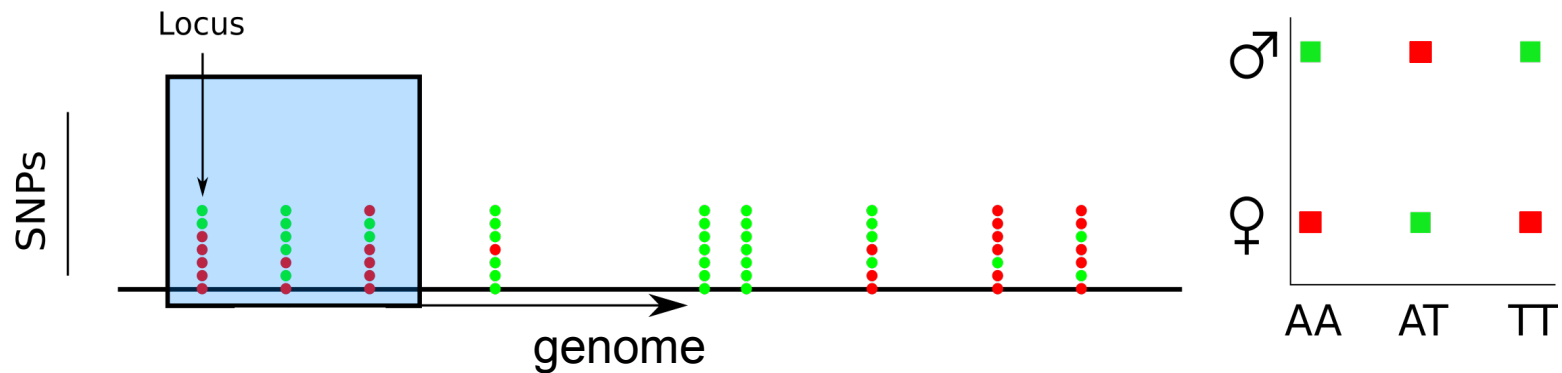


Alternative approach (plan B)

- First approach could fail because:
 - not any loci close enough to CSD
 - *L.fabarum* may be *ml*-CSD
- Use association between blocks of SNPs and diploid male phenotype instead

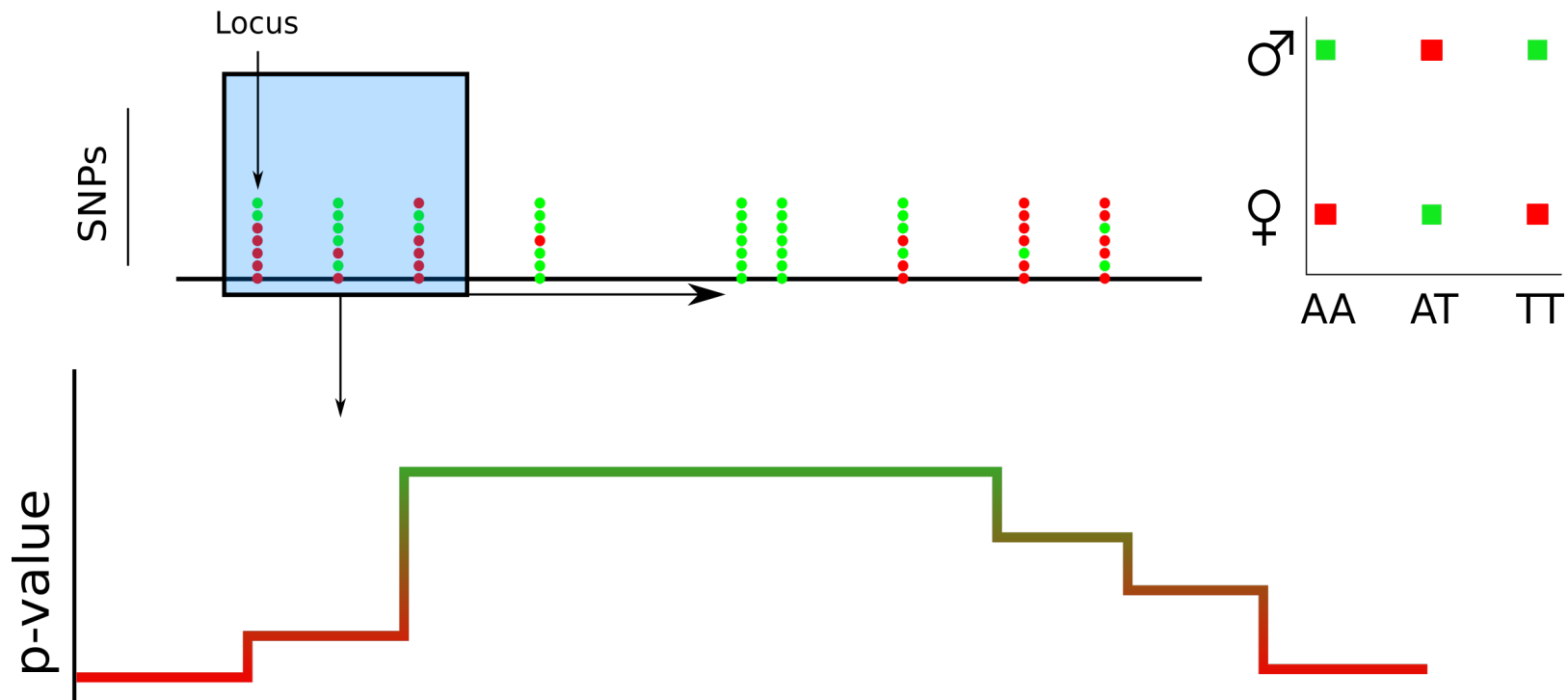
Alternative approach (plan B)

- Classify SNPs in each individual as in approach 1
- Identify regions frequently associated with diploid male phenotype



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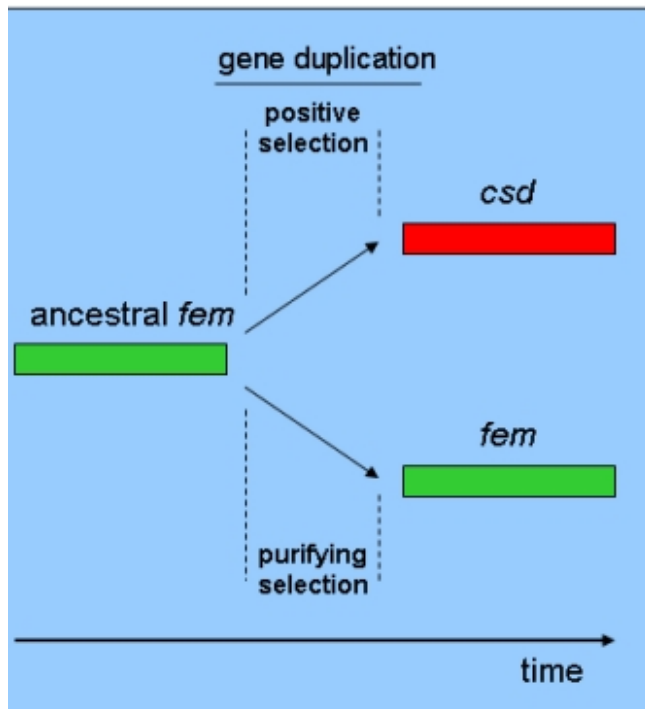


After finding CSD locus ?

- Reference genome currently being annotated
- If annotated: look for candidate genes in CSD locus
- Else: gene prediction in CSD locus
- Look for homologous sequences in related species with CSD

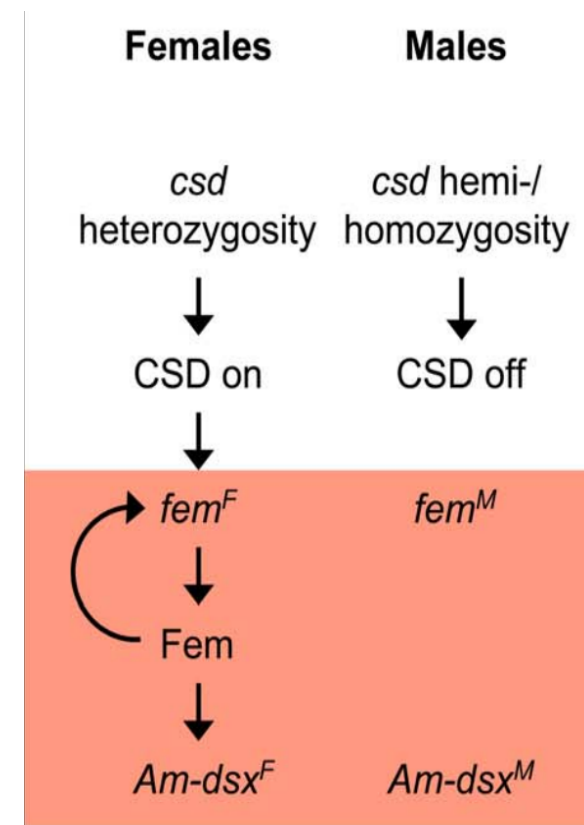
CSD in the honeybee

- In honeybee: recent duplication of ancestral *feminizer* (*fem*) into *csd* and *fem*
- Neofunctionalization of *csd*
- Happened after split between stingless bees, bumble bee and honeybee



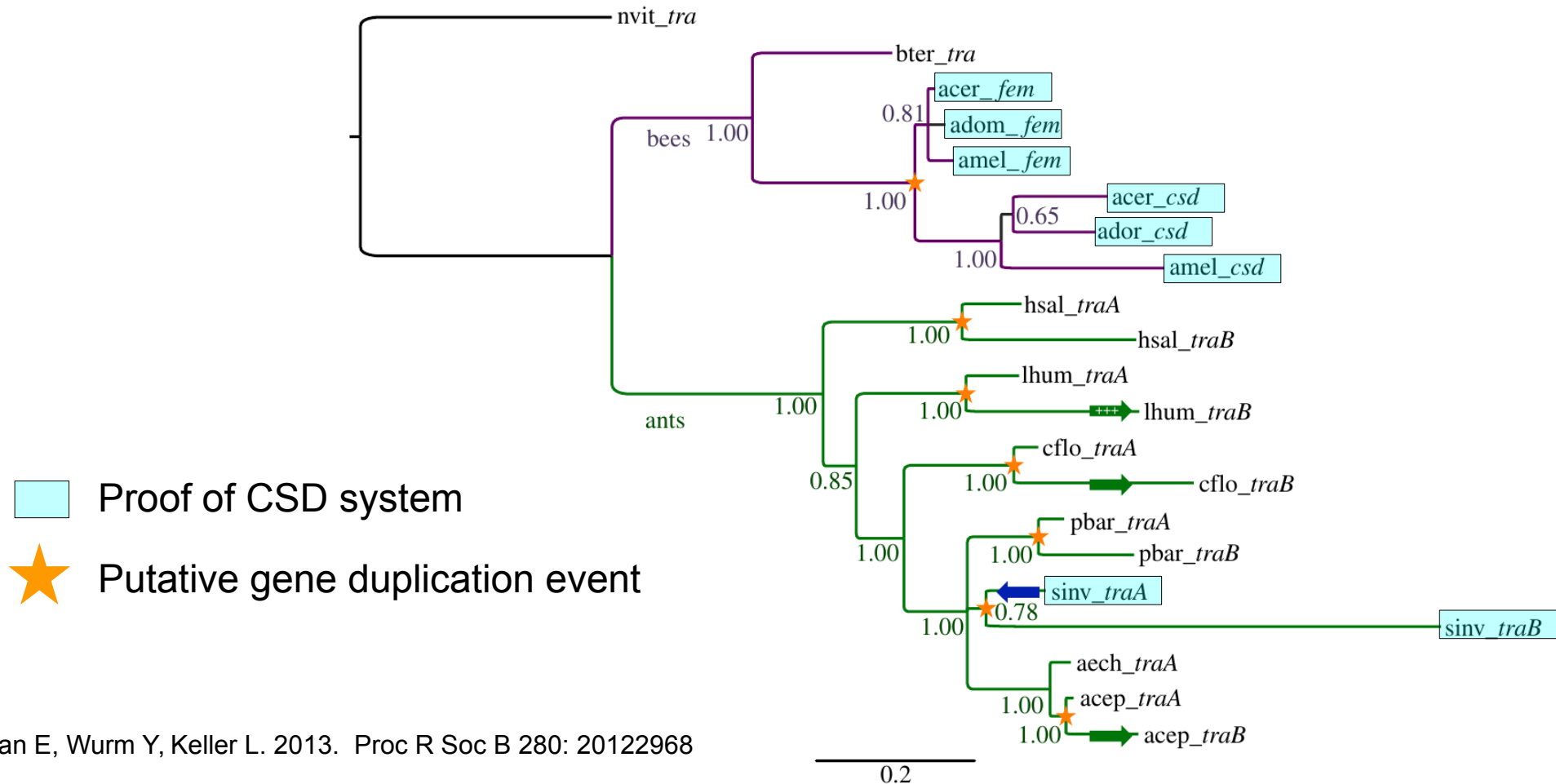
Gempe, T. et al. (2009). PLoS Biology 7(10):e1000222

Gempe, T. & Beye, M. (2009) Nature Education 2(2):1



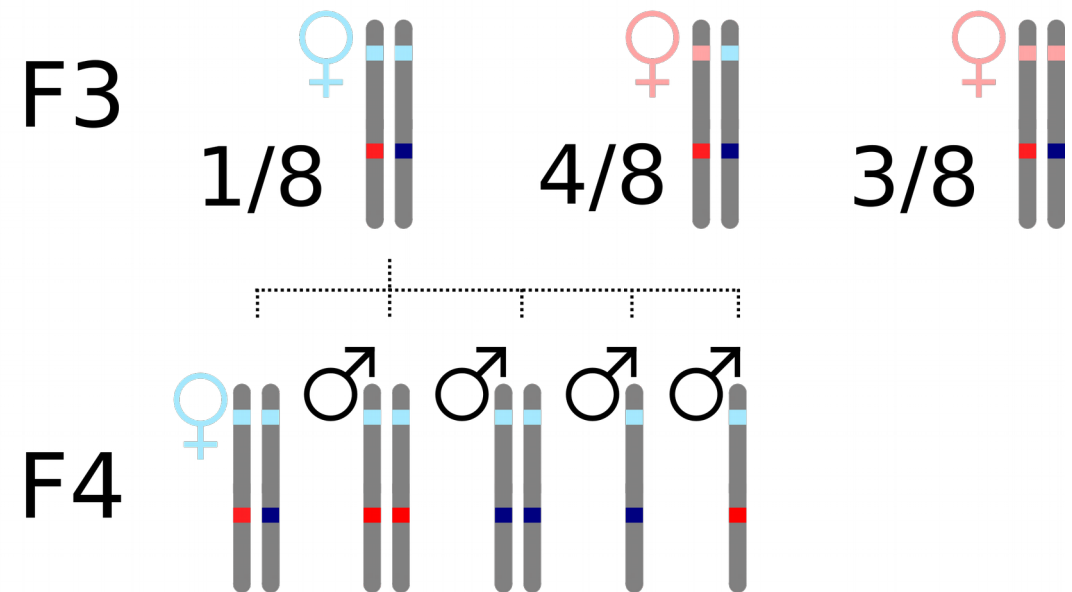
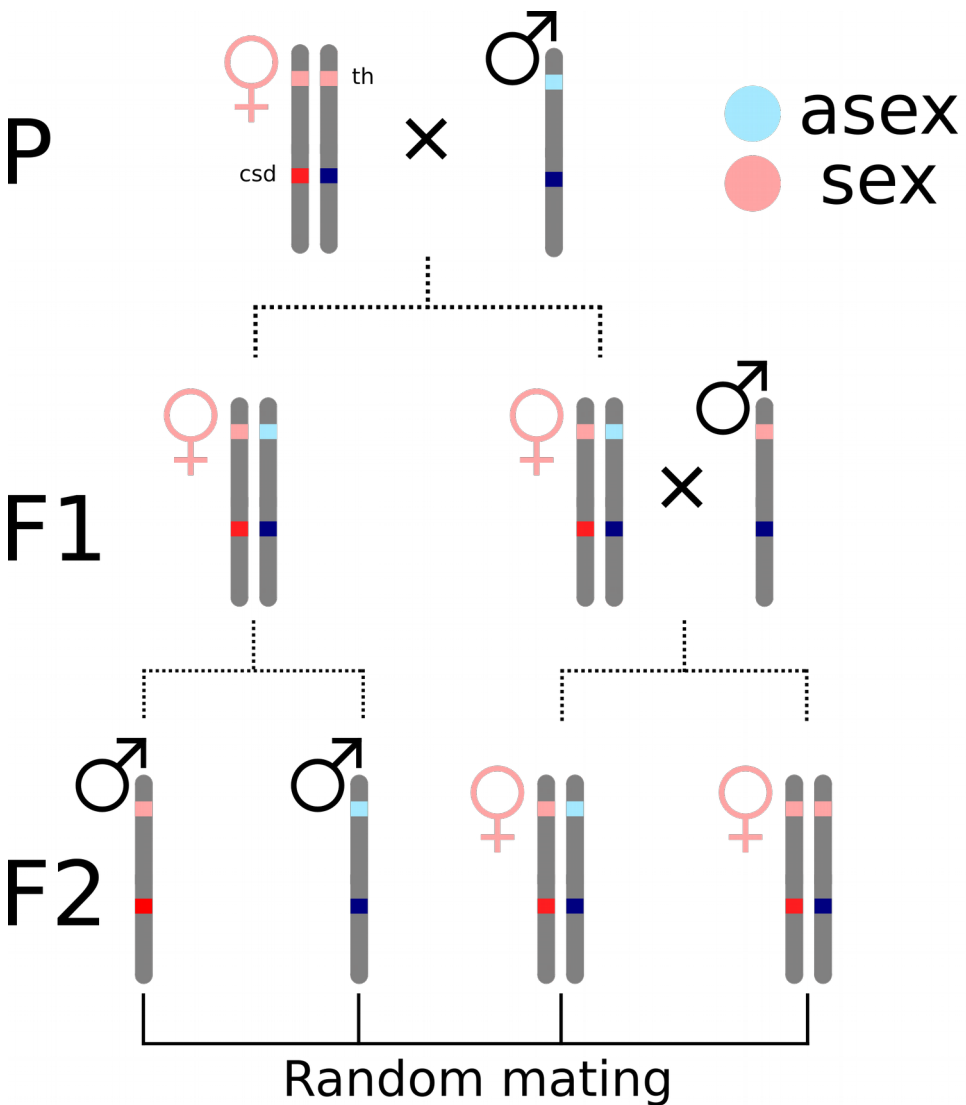
fem/tra across Hymenoptera

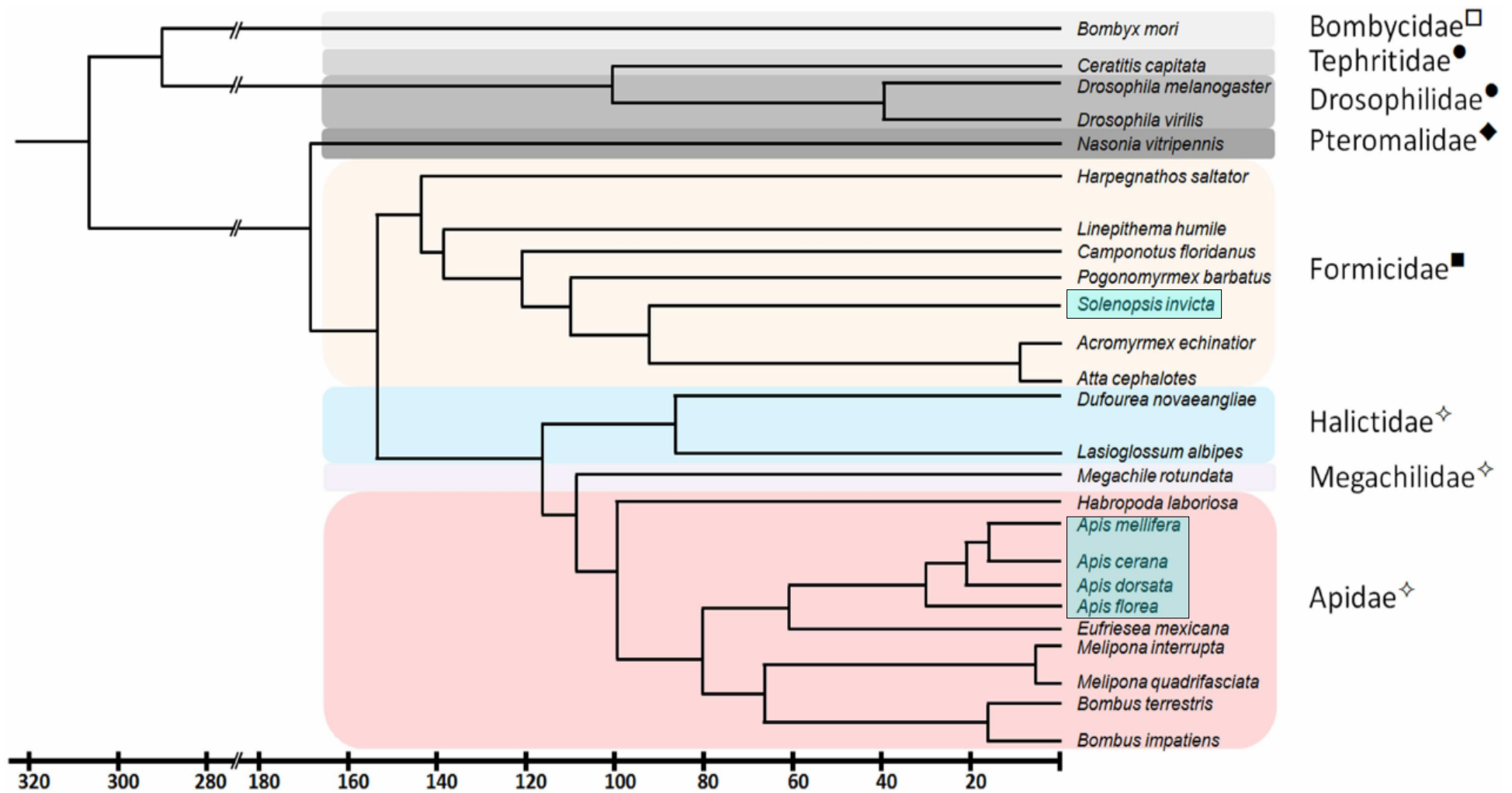
- Independent duplication(s) of *transformer* (*tra*) (*fem* ortholog) in ants
- What happened in *L. Fabarum* ?



Thank you !

Casper's crossings





[illegible]

- *fem* gene copies in social insect species

