Recombination patterns in Rb populations of the house mouse from chiasma analyses

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Chromosomal speciation models

- Chrom rearrangements = partial barriers to gene flow
- Hybrid zones between differentiated populations
  - further accumulate genetic incompatibilities
  - protect locally adaptive genes

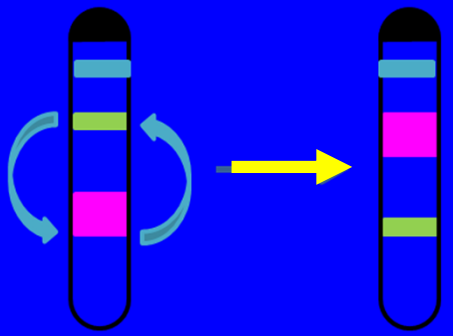
→ Divergence & speciation

- Last decade: shift from hybrid dysfunction to recombination suppression models

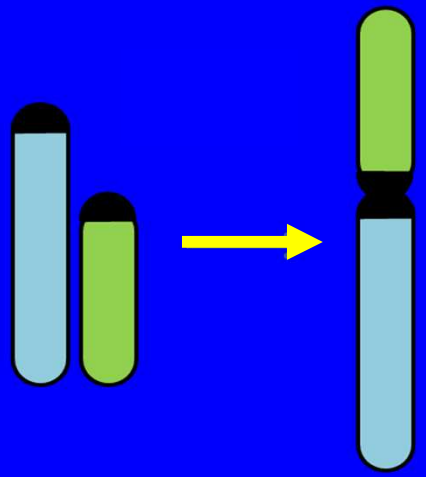
- Rearrangements with low or no underdominance
  - Inversions
  - Rb fusions

Suppressed recombination models

➔ Inversions:
Reduction of recombination in heterozygotes

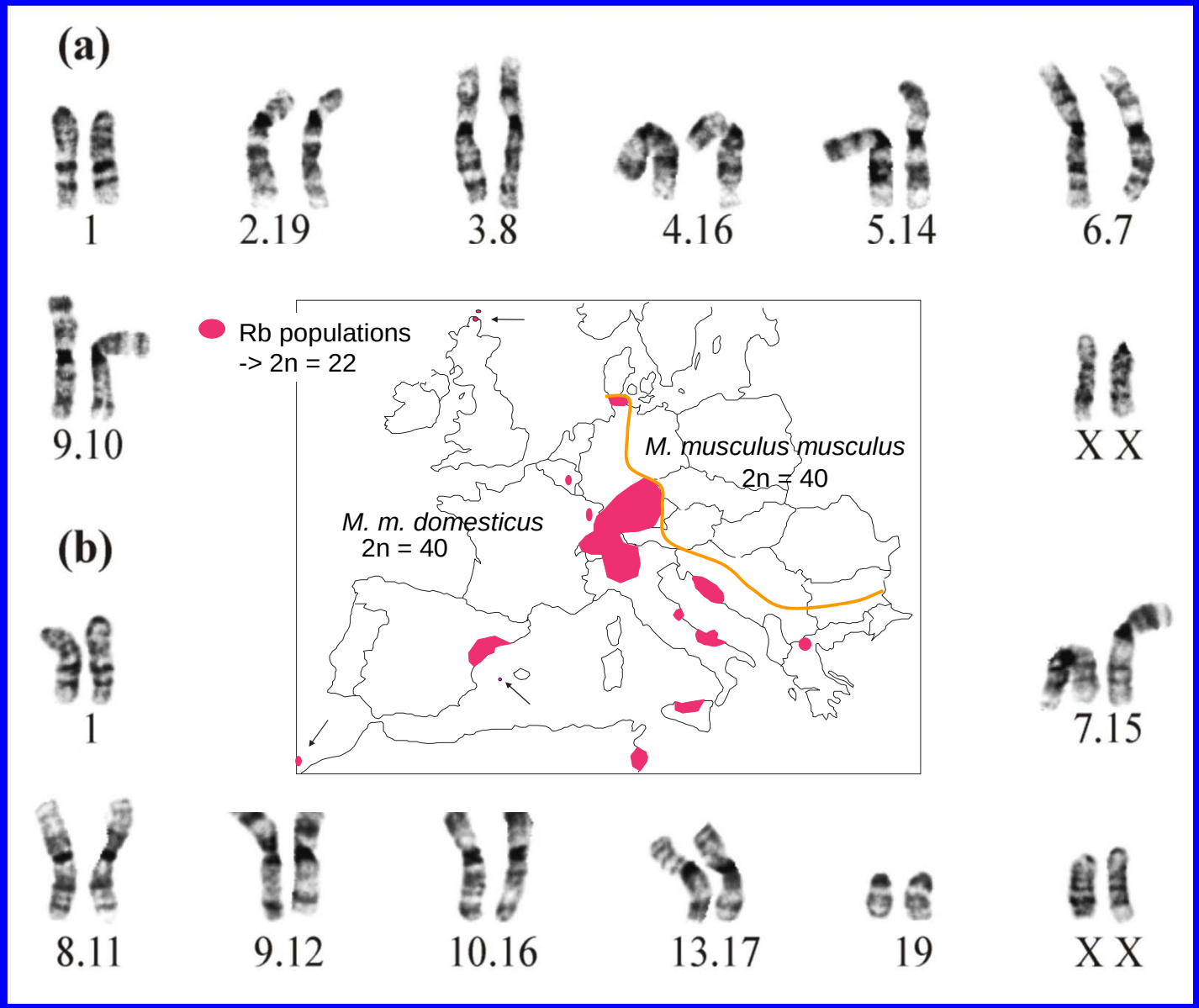


➔ Robertsonian (Rb) fusions ?



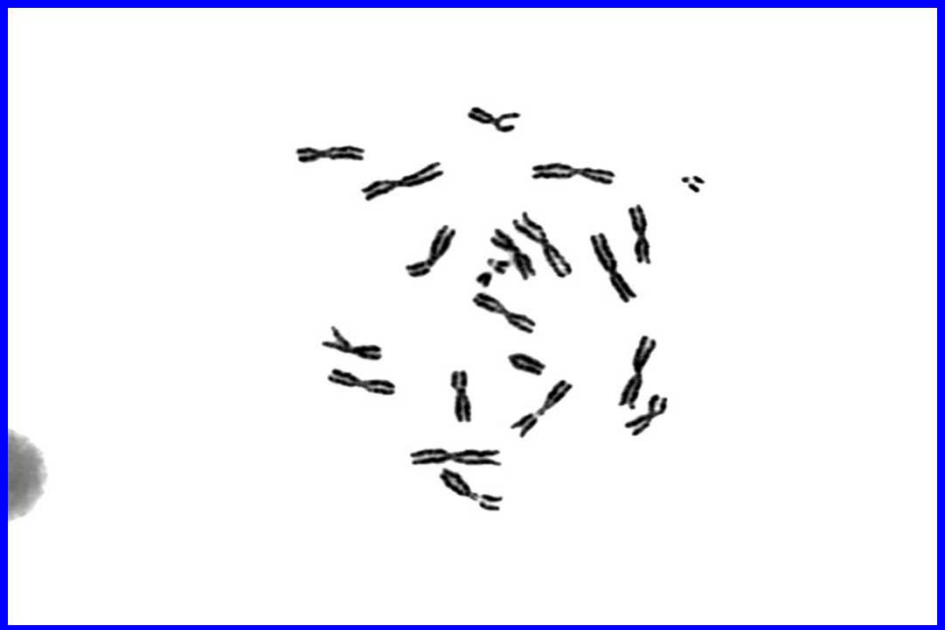
Rb variation in house mice

- 100 Rb populations
- >> 100 Rb combinations



Estimate effect of Rb fusions on patterns of recombination

➔ Comparison of Rb22 vs St40: Tunisia

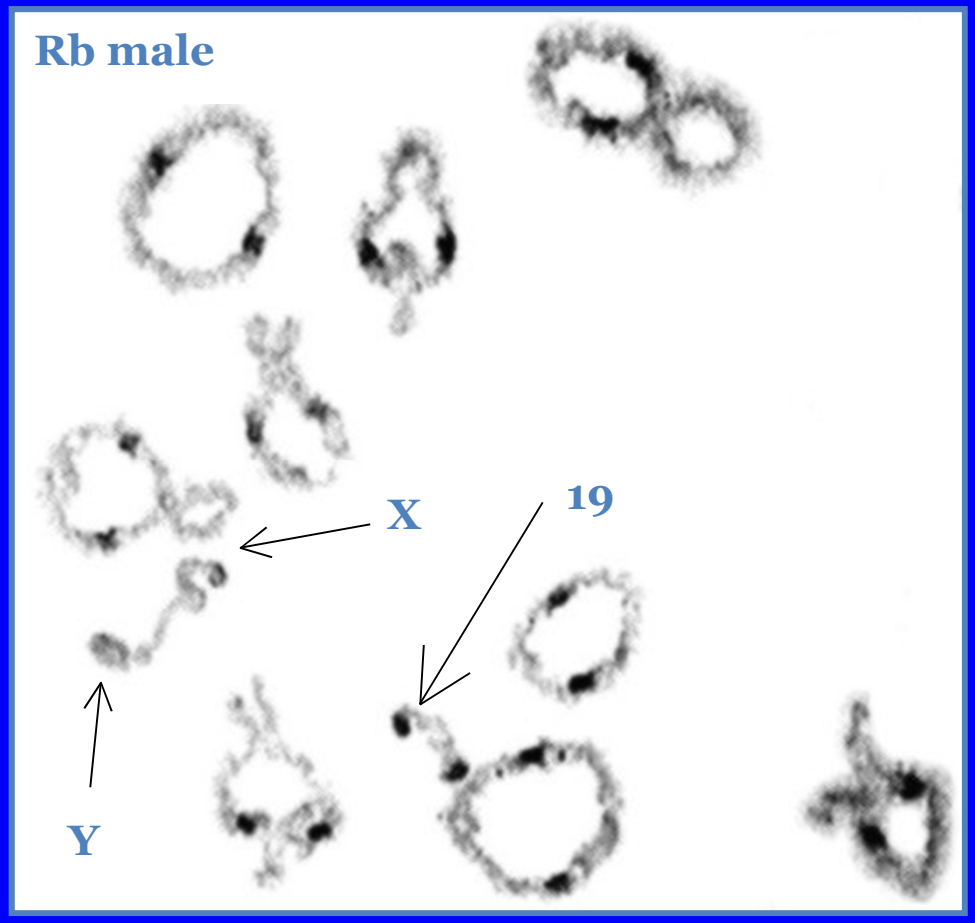


➔ All chromosomes are involved in Rb fusions except autosome 19 and sex chromosomes

Dumas & Britton-Davidian, 2002

Estimate of recombination: chiasma analysis

- Comparison of Rb22 vs St40 female & male homozygotes
- Chiasma estimates: mean of all autosomes par cell/individual



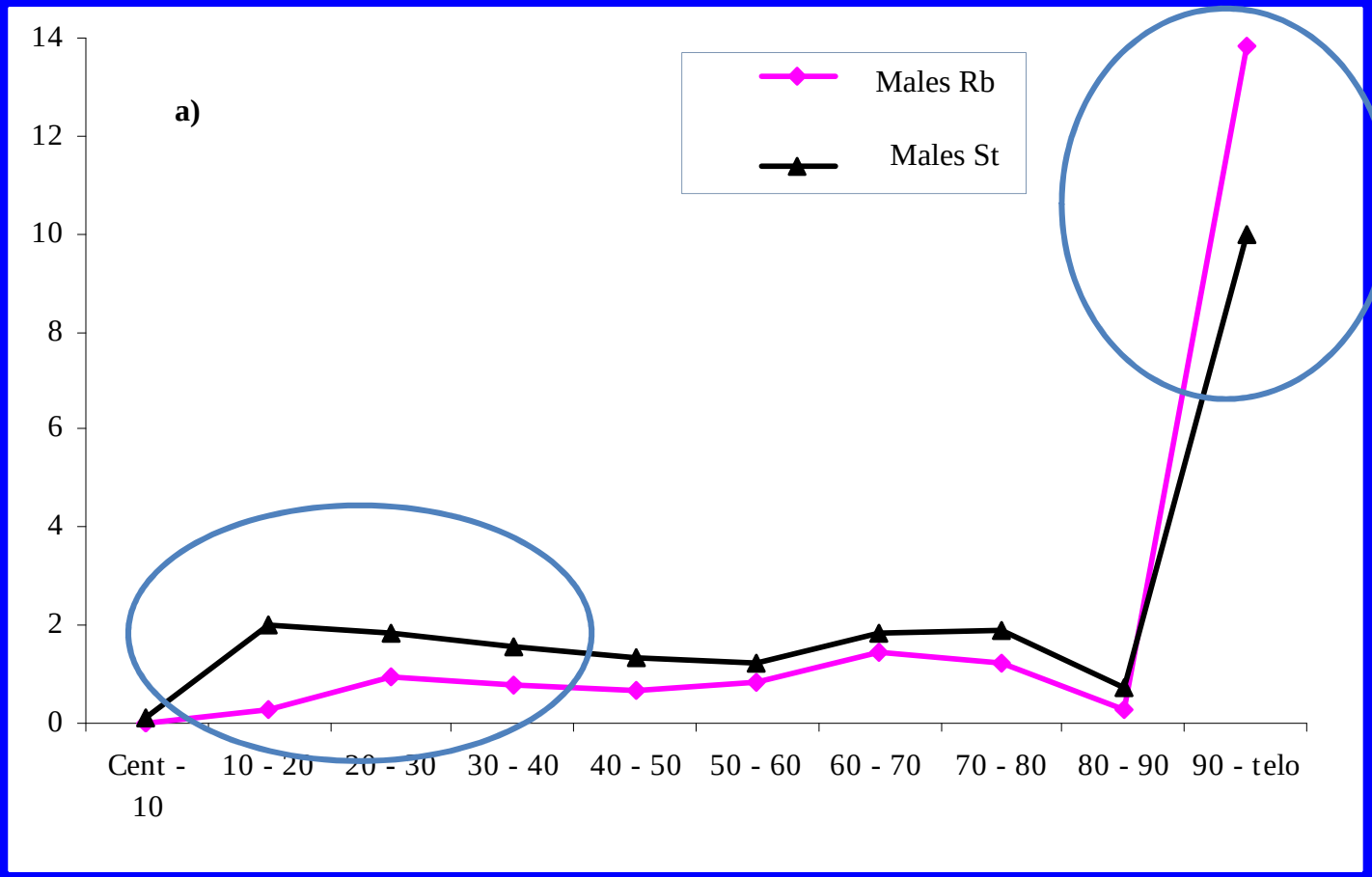
Chiasma Number (CN)

	St40	Rb22
M	23.00	20.25
F	24.39	22.29

St40 > Rb22

Dumas & Britton-Davidian, 2002

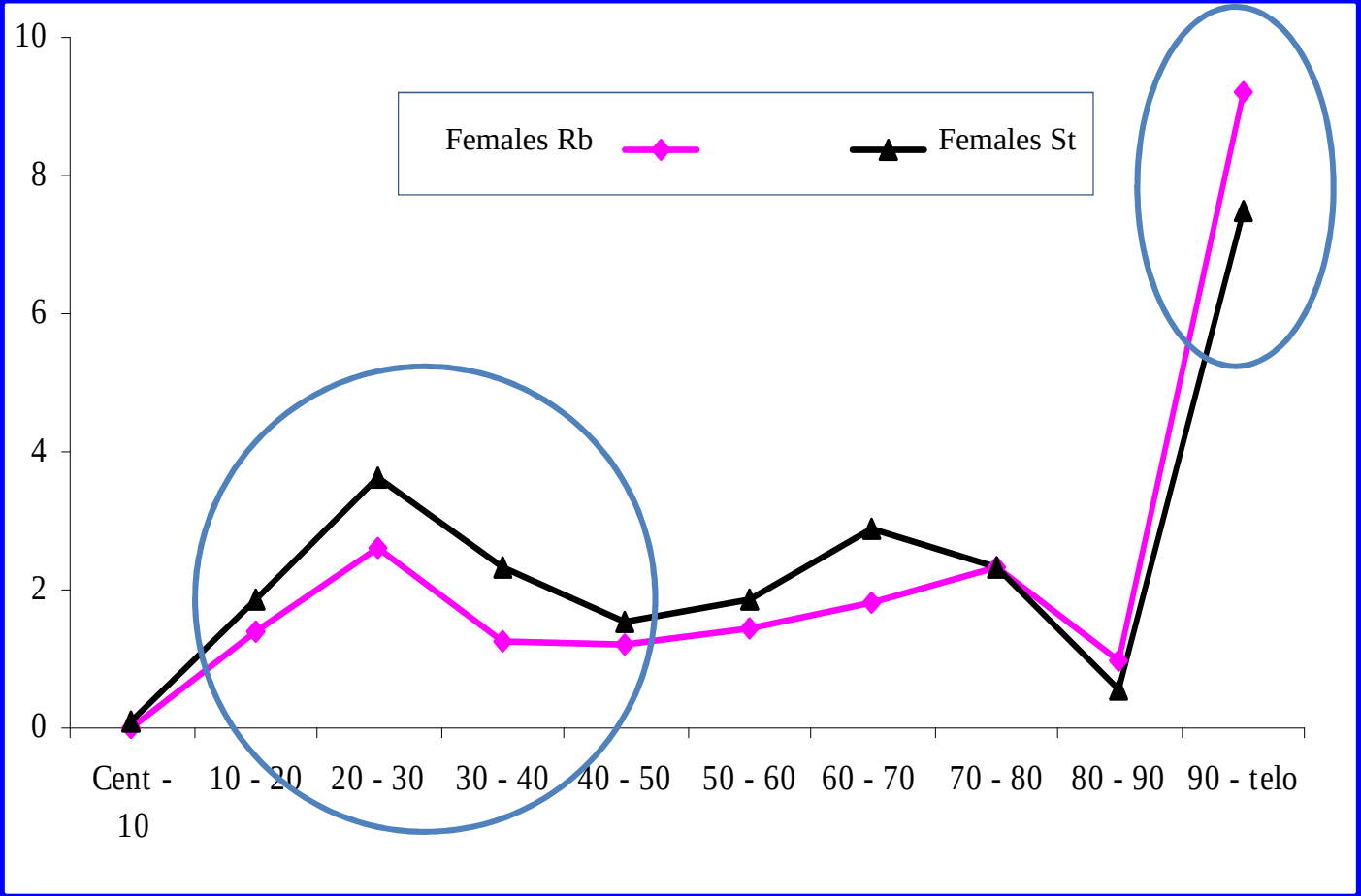
Estimate of recombination: males



➔ Prox: St40 >> Rb22

Dumas & Britton-Davidian, 2002

Estimate of recombination: females



➔ Prox: St40 >> Rb22

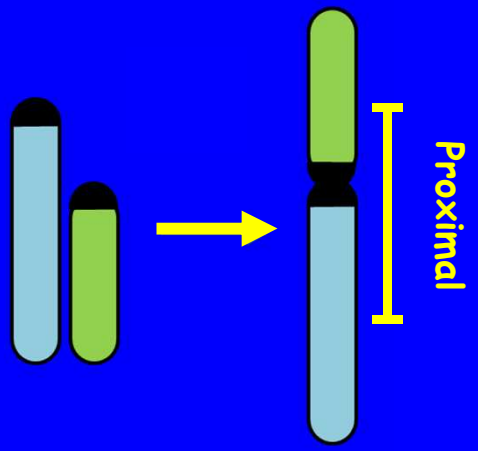
Dumas & Britton-Davidian, 2002

Recombination pattern in Rb fusions: CN, distribution

➔ Rb homozygotes

➔ Decrease in overall recombination **St40 > Rb22**

➔ Decrease in proximal recombination



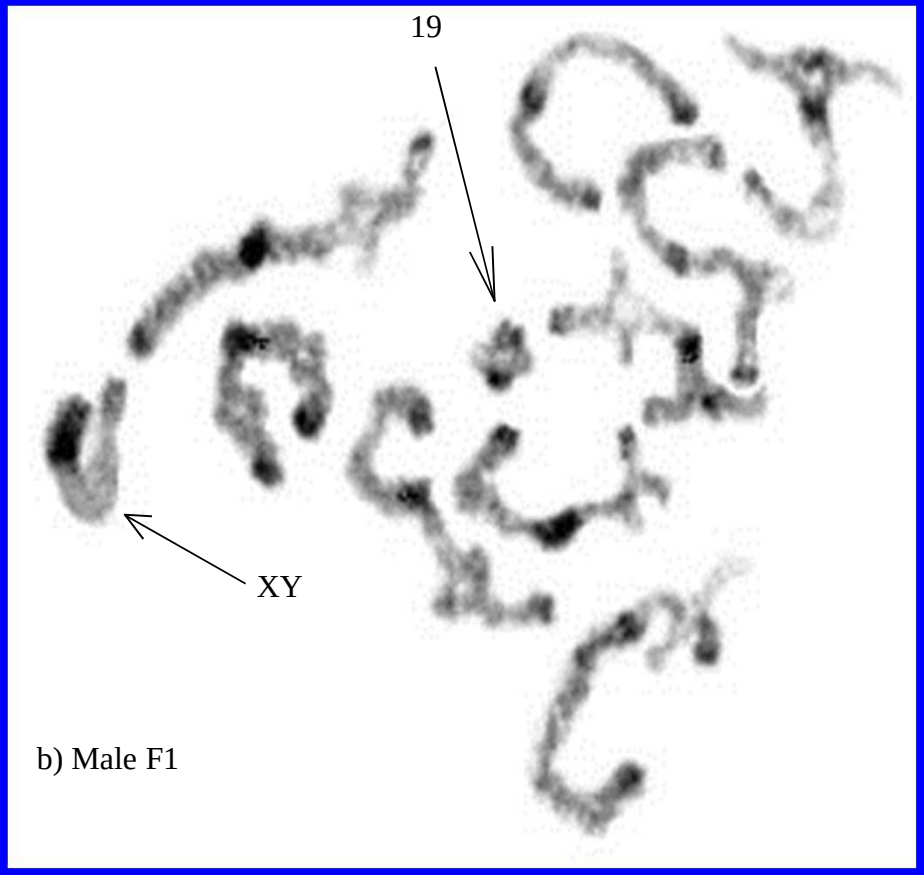
➔ Rb heterozygotes ??

Pattern of recombination in Rb heterozygotes

- F1 from crosses between Tunisian Rb22 & St40
- 2n= 31 males (104 cells) & females (58 cells)
- 9 trivalents, bivalent 19, sex chromosomes
- Chiasma estimates: mean of all autosomes par cell averaged per individual
- Comparison with previous data for Rb22 & St40

Dumas et al., submitted

Pattern of recombination in Rb heterozygotes



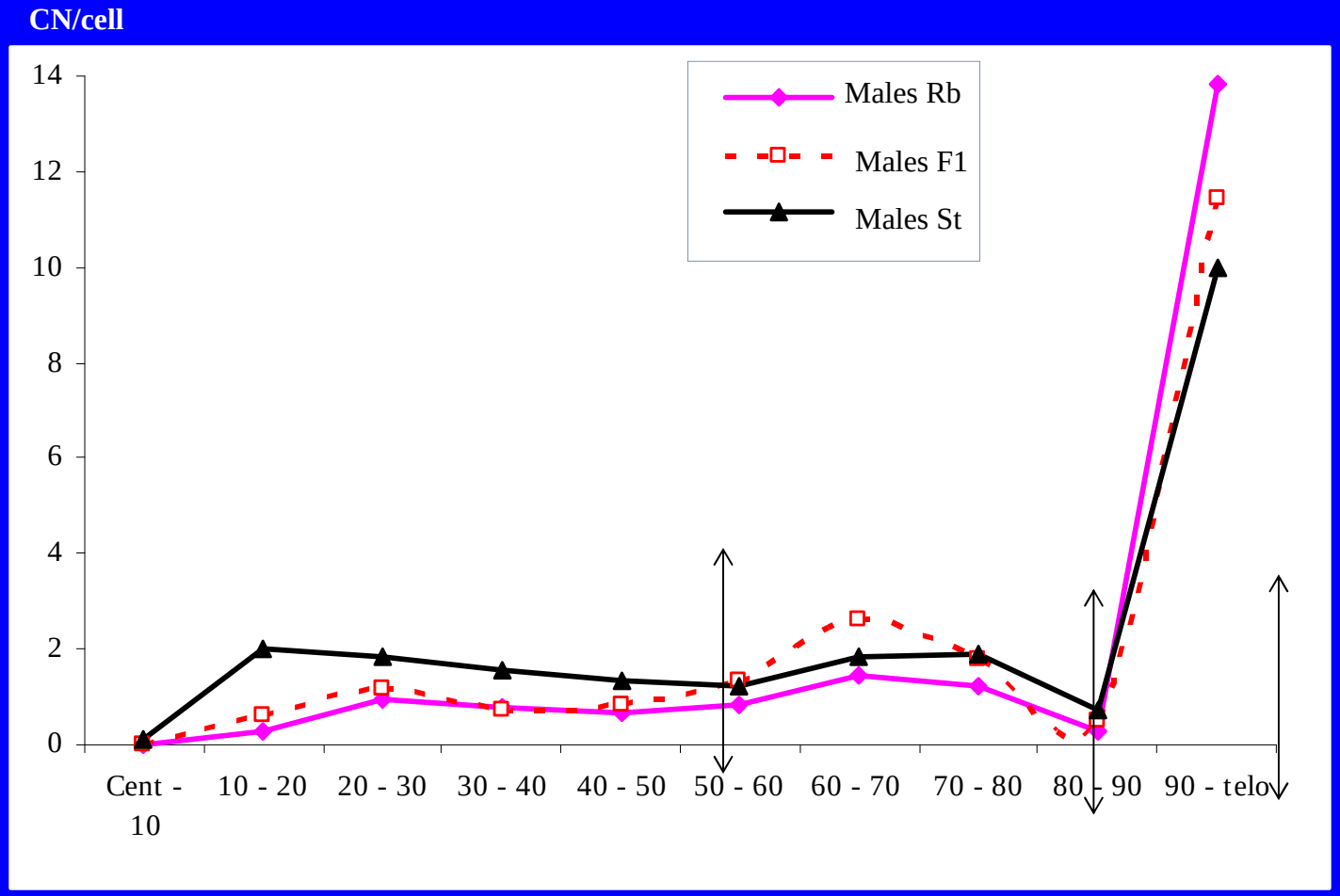
b) Male F1

Results: CN

	St40	F1	Rb22
M	23.00	21.04	20.25
F	24.39	23.82	22.29

St40 > F1 > Rb22

Pattern of recombination in Rb heterozygotes: males

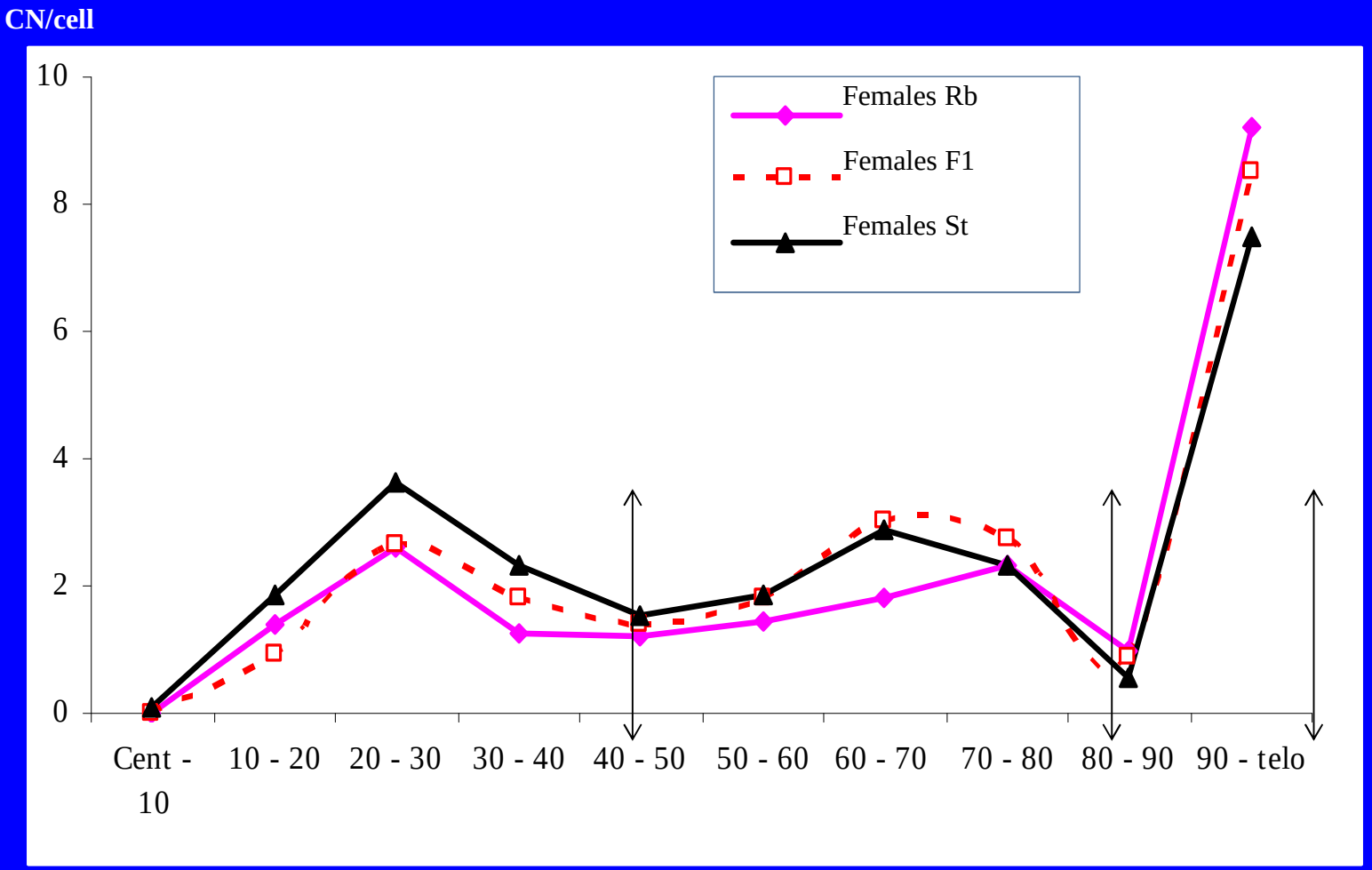


F1 = Rb22

F1~St40

F1 =St40

Pattern of recombination in Rb heterozygotes: females



F1 = Rb22 F1~St40 F1 =St40

Pattern of recombination in Rb heterozygotes

→ CN in F1 is intermediate between Rb22 & St40

→ Distribution of CN in the proximal region F1= Rb22

→ Proximal regions:

- Reduced recombination in <u>both</u> Rb homozygotes & heterozygotes (≠ inversions)

→ Sufficient to create a barrier to gene flow?

→ Genetic assays using microsatellites: yes!

- Reduced recombination in the proximal 25% of the chromosome
- Accumulation of genetic incompatibilities

Pattern of recombination in Rb fusions

- Heterozygosity for Rb fusions does modify recombination patterns ✓
- Effect on gene flow in proximal regions ✓
- Potential contribution to divergence between populations & speciation ✓

Thanks

David DUMAS

Josette Catalan

Sex & Speciation Team

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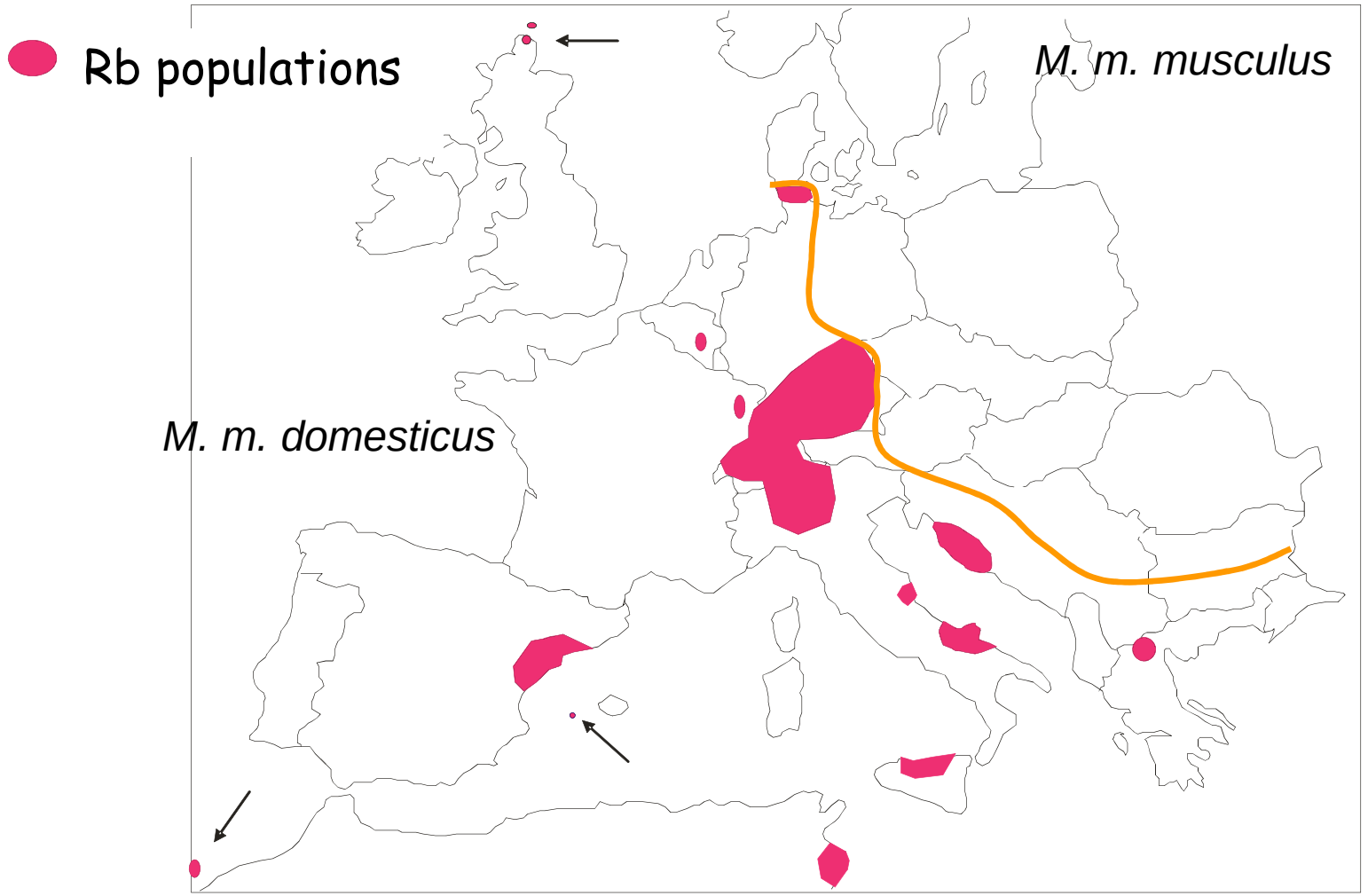
Additional questions

➔ House mouse = genome Rb-prone

Why not everywhere?

Rb variation in house mice

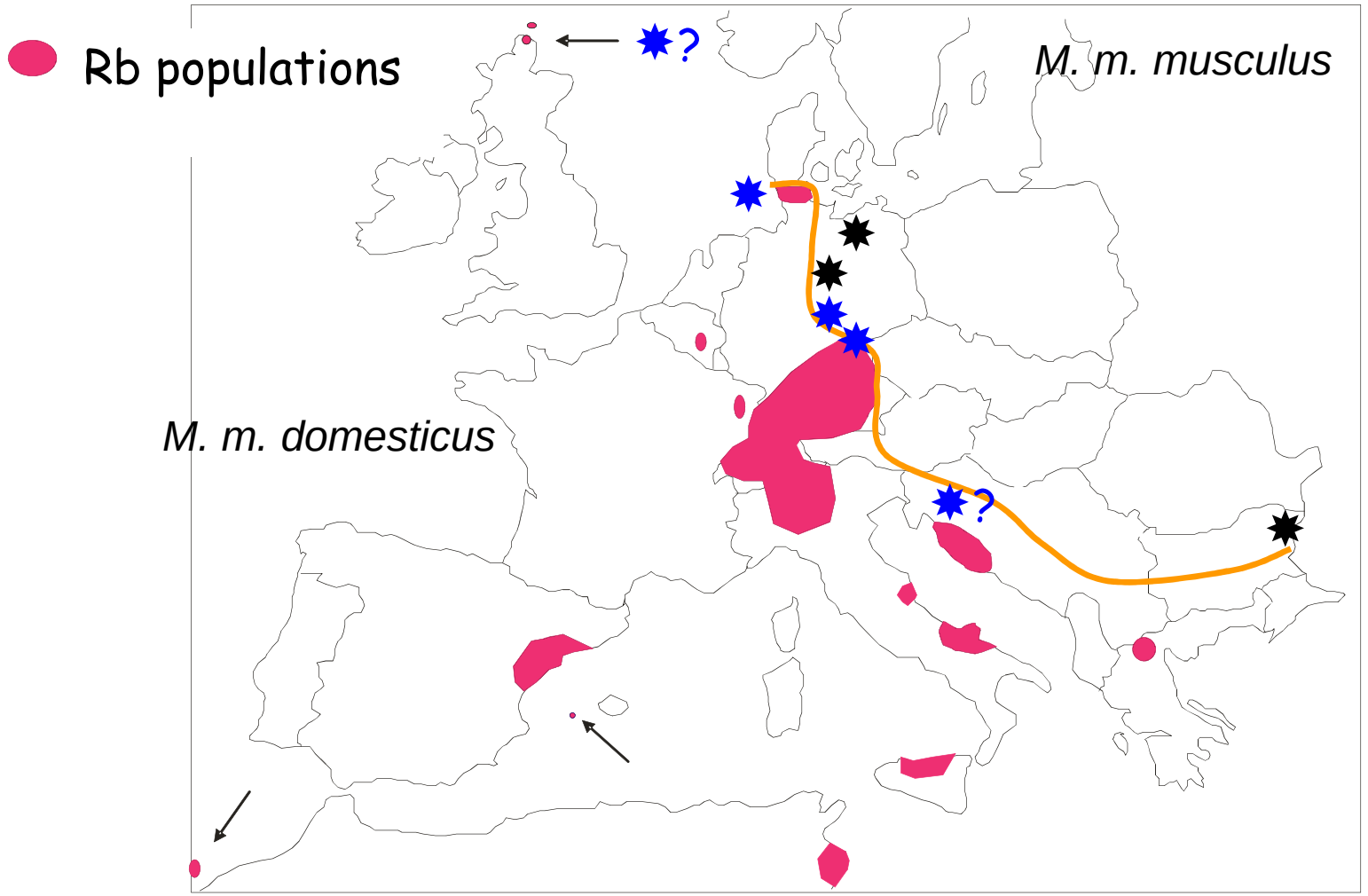


Additional questions

➔ House mouse = genome Rb-prone
Why not everywhere? Is there a trigger?

If random: local conditions (stochastic)
If non-random:
➔ Distribution of races: HZ + Medit Basin
➔ Zones where mixing of populations: genomic instability syndrome?

Rb variation in house mice



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➔ HZ with M. m. musculus
1. Trigger?
2. Reduced proximal recombination: selection for Rb fusions?

Rb variation in house mice