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Divergent evolution of genetic sex determination mechanisms along environmental gradients

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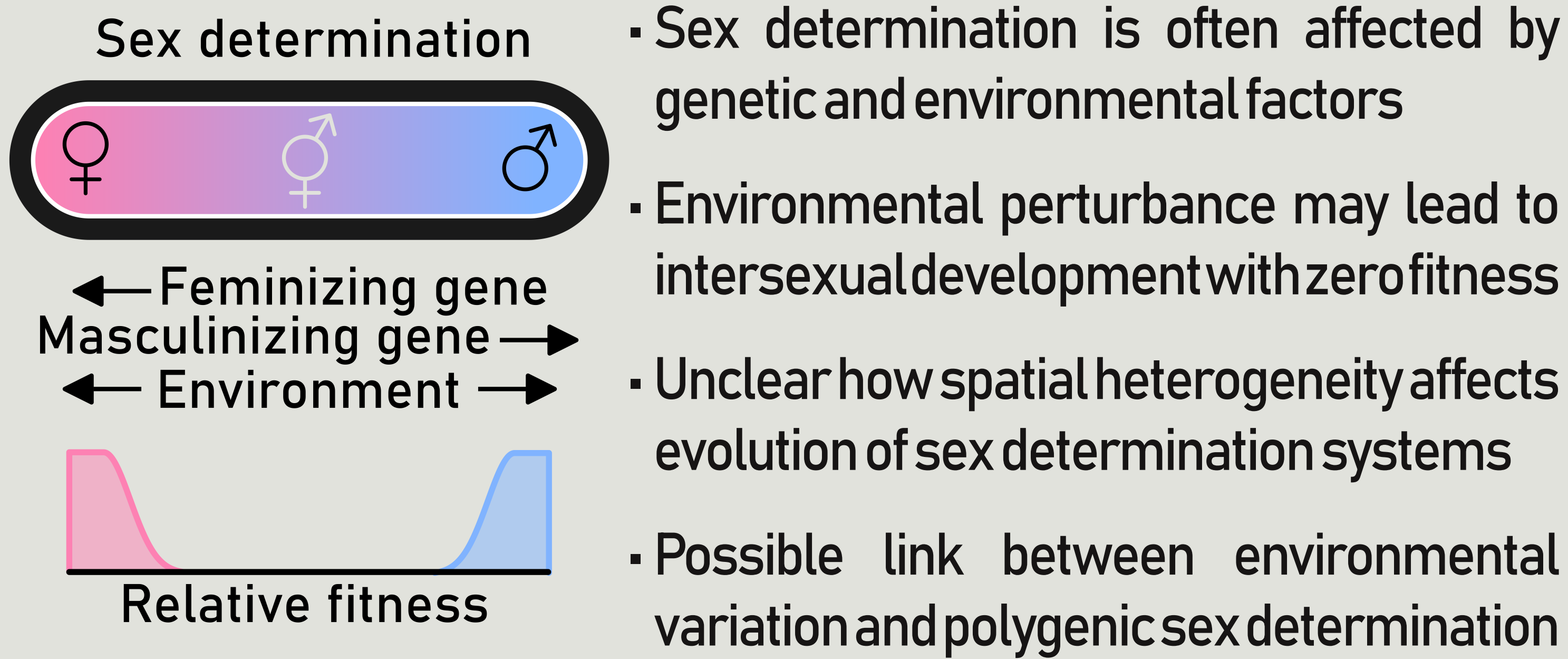
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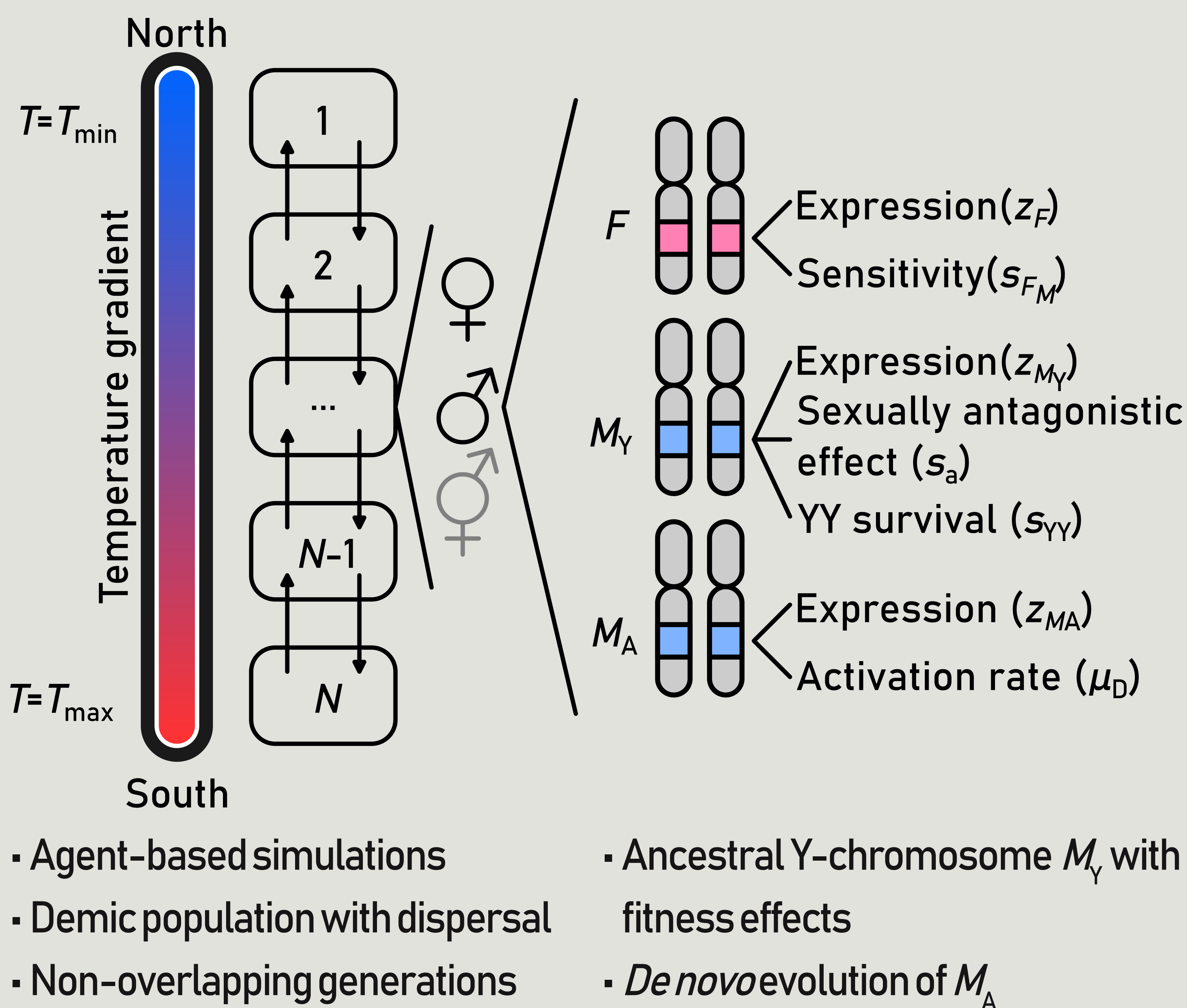
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Background information

Main question: How do genetic sex determination systems evolve when gene expression is influenced by environmental conditions?

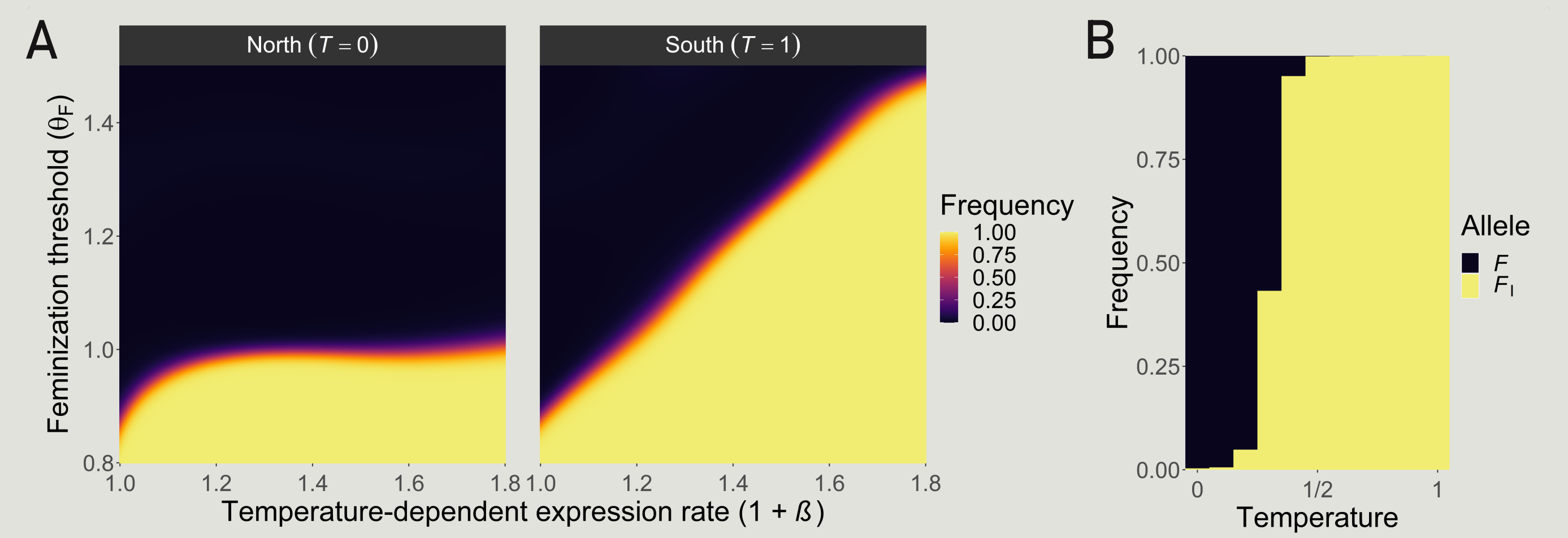


Model overview

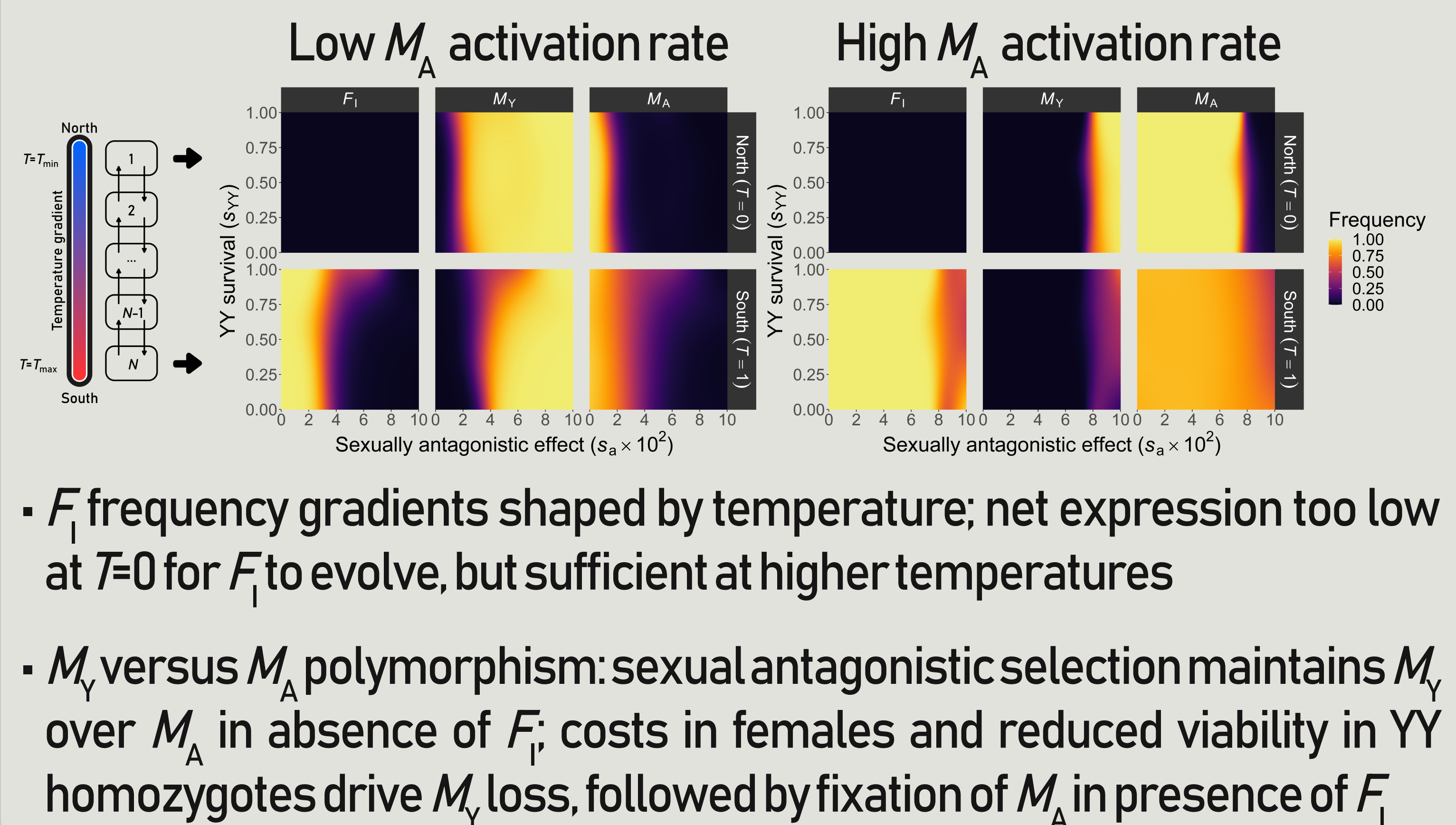


Evolution of a dominant feminizer F_1

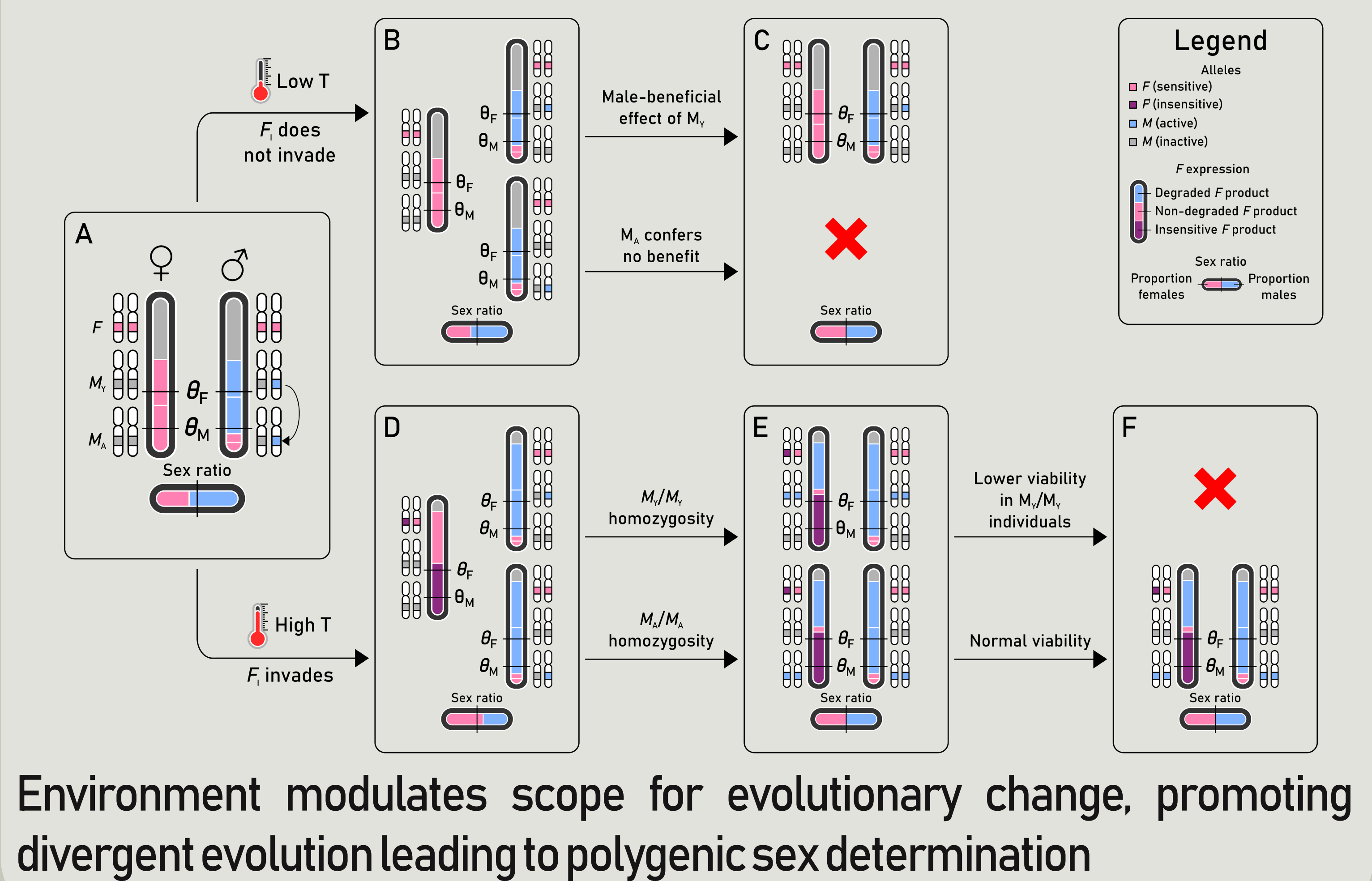
F_1 : fully insensitive to M_Y and M_A , net expression exceeds θ_F , so that carriers are always female



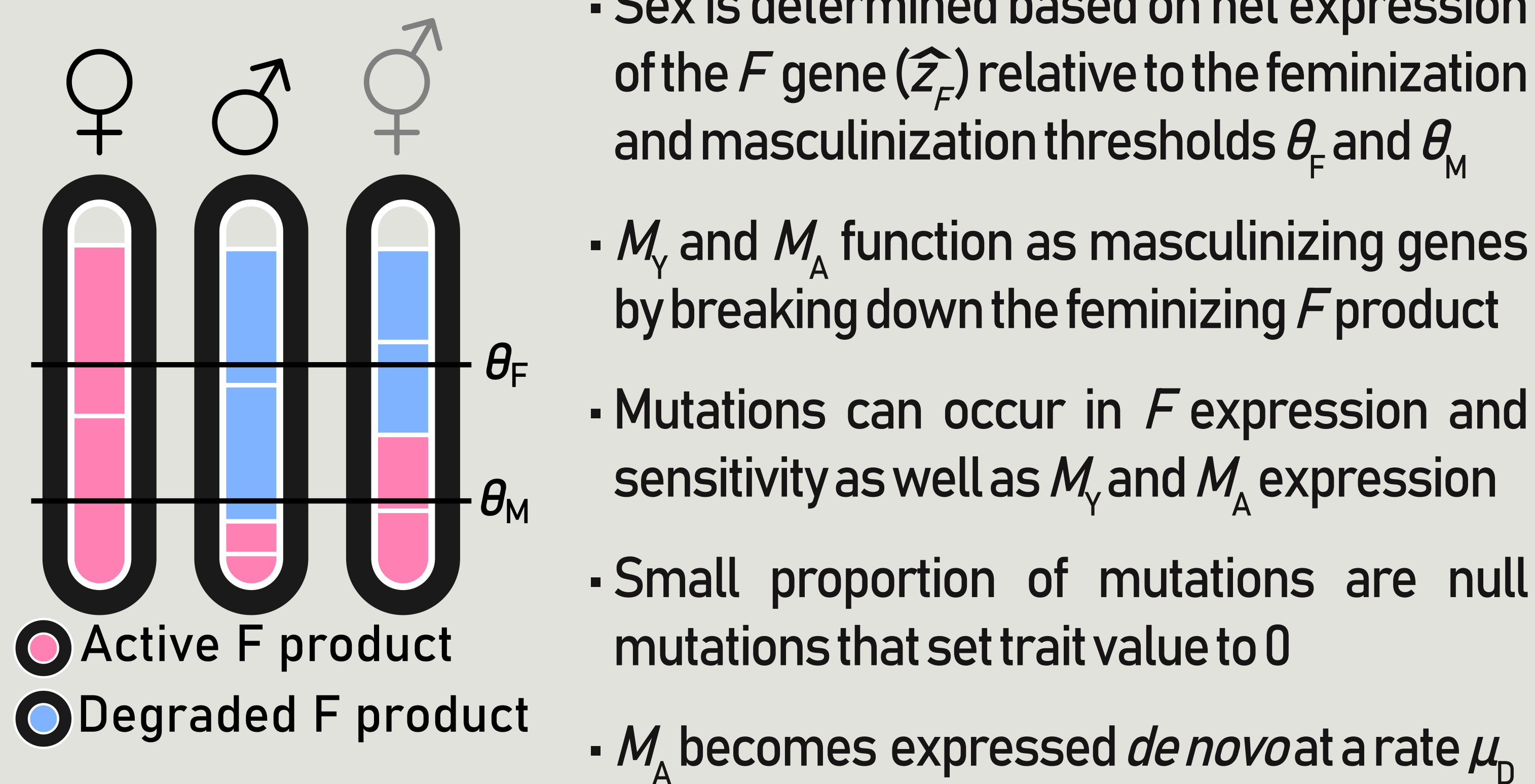
Frequency gradients at multiple loci



Conclusion



Sex determination gene functions and evolution



$$\hat{z}_F = \sum_{i=1}^2 \max(0, (z_{F_i} (1 + \beta T) + \varepsilon) (1 - s_{FM_i} \sum_{j=1}^2 z_{M_{Y_j}} + z_{M_{A_j}}))$$

Labels for equation components:
 z_{F_i} : F genetic expression level
 βT : Temperature effect coefficient
 ε : Noise (Gaussian)
 s_{FM_i} : Sensitivity to M
 $z_{M_{Y_j}}$: M_Y expression
 $z_{M_{A_j}}$: M_A expression
 $\sum_{j=1}^2 z_{M_{Y_j}} + z_{M_{A_j}}$: Total M expression
 $(1 - s_{FM_i} \sum_{j=1}^2 z_{M_{Y_j}} + z_{M_{A_j}})$: M -dependent breakdown rate of F

Funding



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