

Norm. Johnson - Reproductive Isolation

Genetics of Reproductive Isolation - Post-Mating

© Lewontin 1974 - Evolutionary genetics hasn't given any info about speciation

1972 Haldane's Rule - when in the F_1 generation after a cross one of the sexes is sterile -- it is the heterogametic sex

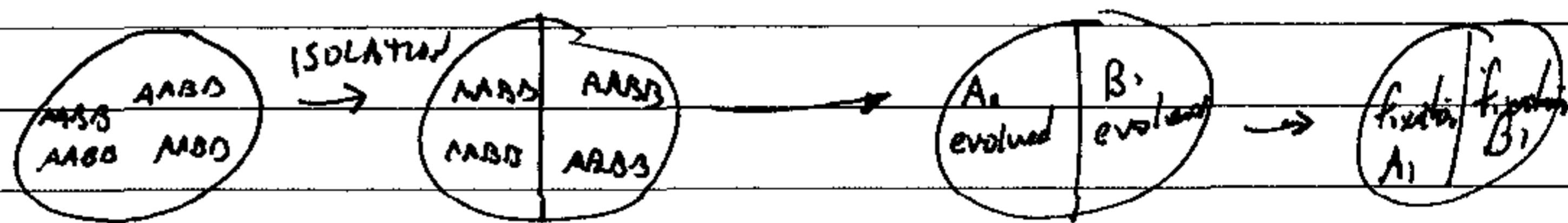
Drosophila - many more cases of σ being sterile than ♀ in F_1 ...

ALLOPATRIC SPECIATION MODEL - MAYR, DOBZHANSKY, MULLER

- Population

- Two genes A & B

- Suppress A_1 & B_1 ... lower fitness when together



What are the genetics of this?

Selection vs. drift in process of A_1 & B_1 ?

Subdivision, epistasis, & linkage importance? (FISHER vs WRIGHT)

W/in species variation for isolation?

Novel genetics (TRANS & MEIOTIC DRIVE)?

Sexual selection?

Approaches

- III) RESCUE
GENES
- i) Backcross --- Dobzhansky
- Species 1 x Species 2
- ↓
- F₁ ♂ = sterile
♀ = fertile x ♂₁ ♂₂
- IV) HYBRID
ZONES
- V) QUANT.
GENET.
- map affects to regions
- X important (Coyne & Orr)

II) Introgression

- small genetic replacements
- test sterility
- use RFLP's, PCR-SSCP to map introgression

D. simulans & D. mauritiana & D. seashole

- v. similar to each other
- D.m. restricted to Mauritius island (nr. Madagascar)

RESULTS

- 1)
- 2) EPISTASIS IMPORTANT

~~sim~~^B ————— sterile

~~sim~~ ————— fertile

~~sim~~ ————— fertile

3) Density of hyb. sterility factors
greater in

$D. simx \times D. maur$ than $D. simx \times D. seac.$

Y chromosome

from $D. seac$ in $D. simulans$

① Lower virility (multiple ♀)

② Lower sperm displacement

③ Longer adult longevity

Meiotic Drive

- Does divergence of meiotic drive systems explain
Haldane's rule?

Frank 1991 Evolution 45: 262

Hurst & Pomnickowski: 1991 Genetics 128: 841

Johnson & Wu Genetics 130: 507

$D. melano \times D. simulans$

- both F_1 's sterile

~~$D. melano \times D. simulans$~~

V) QUANT. GENET. OF REPROD. ISOLATION

Tribolium castaneum

- world wide distribution

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- XY = ♂

T. freemani

- v. rare

- v. similar to

T. castaneum

- XY = ♂

- much bigger than T.C.

- not much pre-mating isolation

- but facultative postmating but prezygotic isolation

- Diff. T. cast. strains show variation in viability of F₁ from crosses w/ T. freemani

- DO DIFF. STRAINS
HANG VARIATION
IN CROSSES W/
EACH OTHER?