METAPOPULATION AND GENETIC CONSERVATION OF PRIMATES

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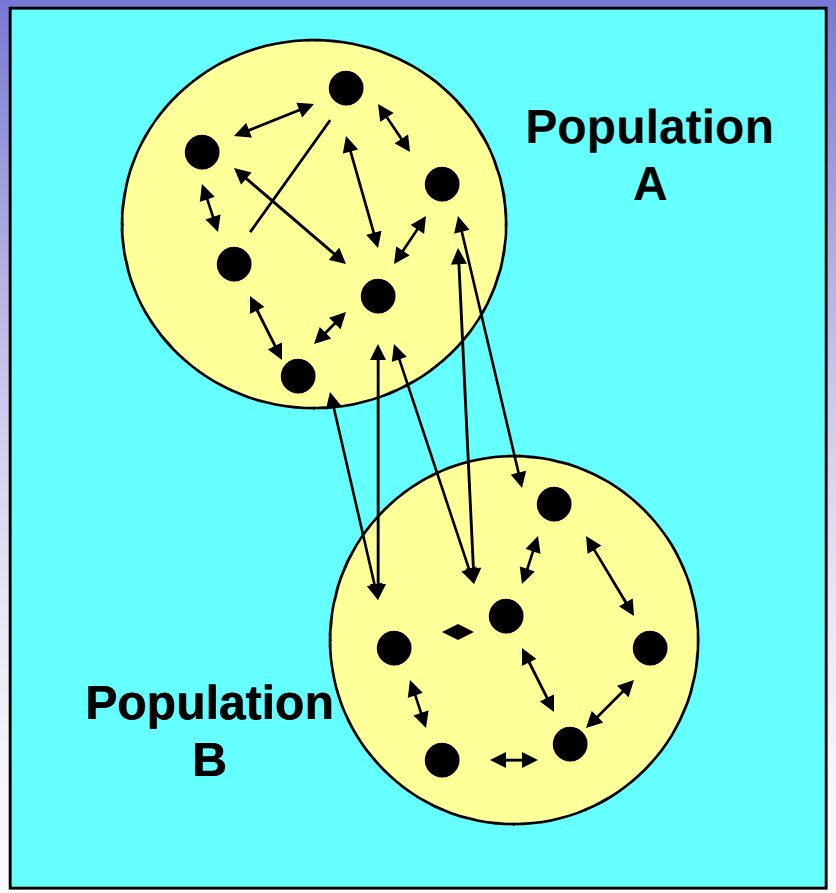
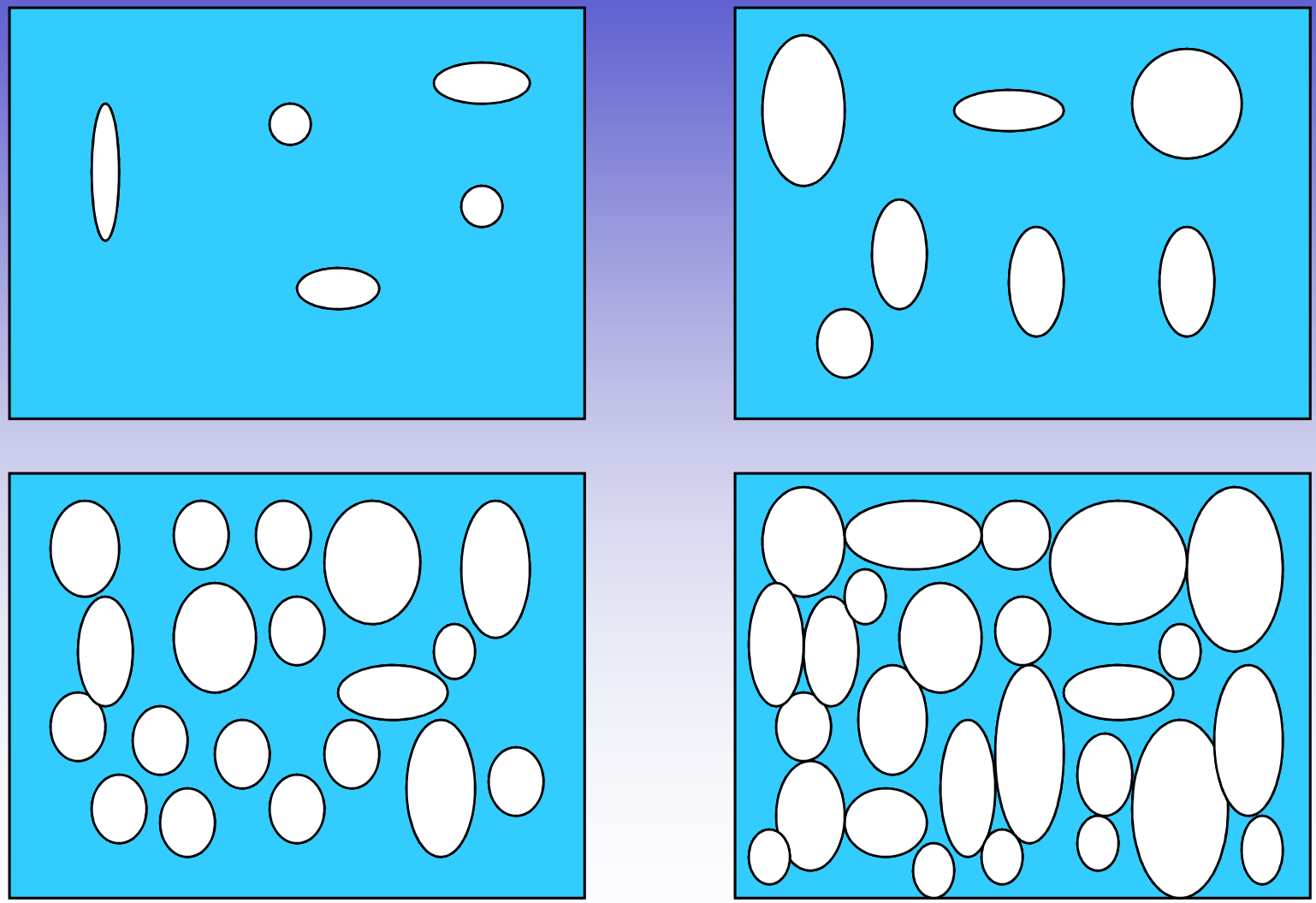
Metapopulation (Levins, 1970)

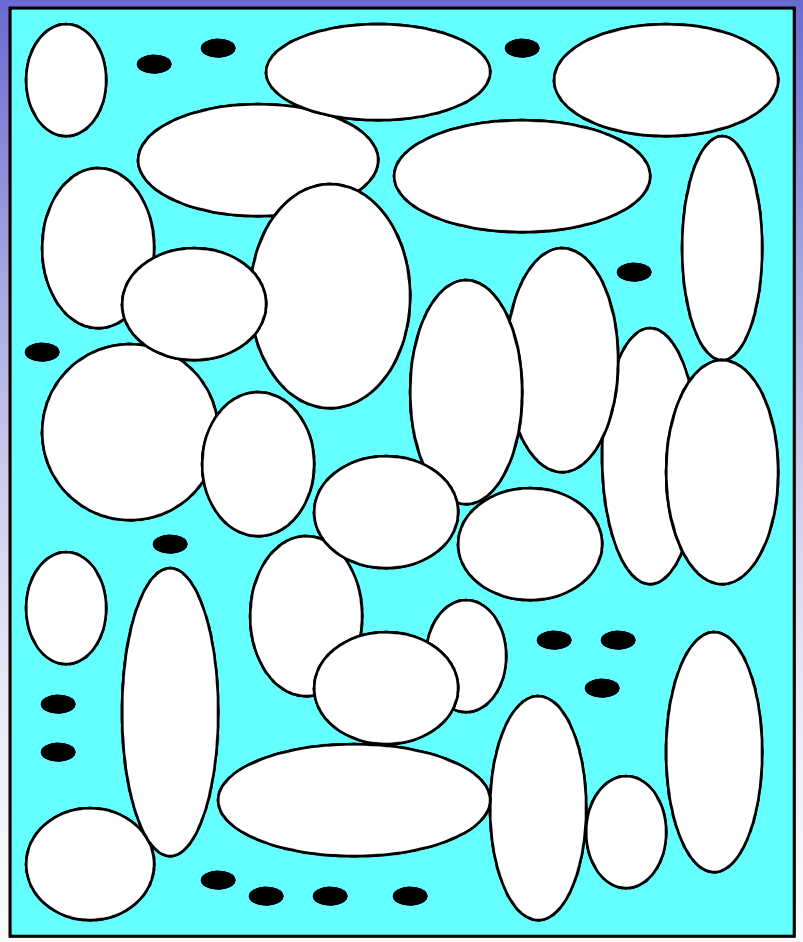
- A population of population
- Sets of sub divided populations in which rates of mating, competition, and other interactions are much higher within than among population



Matrix and Habitat Patches

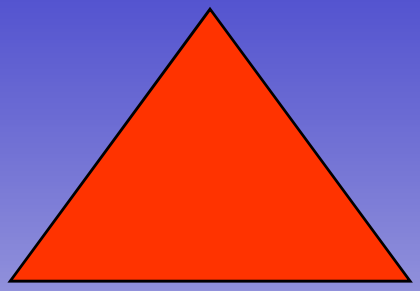


Metapopulation

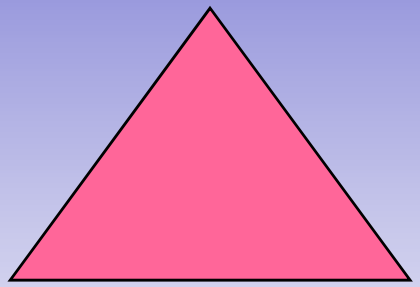


- Discontinuous in distribution, in spatially disjunct patches of suitable habitat (patches) separated by intervening unsuitable habitat (matrix)
- Dispersal is restricted
- High probability of local extinction
- Balance between extinction within patches versus recolonization among patches (dispersal)

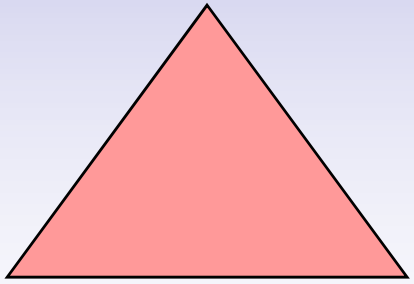
Panmictic (Well Mixed) vs Metapopulation



$n = 100$

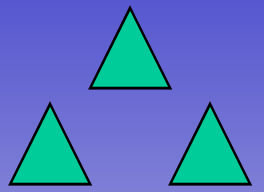


$n = 67$

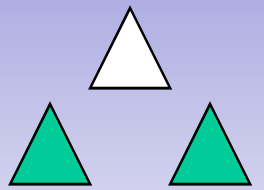


$n = 33$

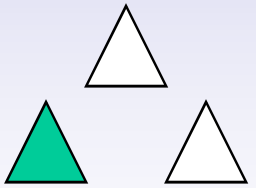
Time



$p = 1.00$



$p = 0.67$

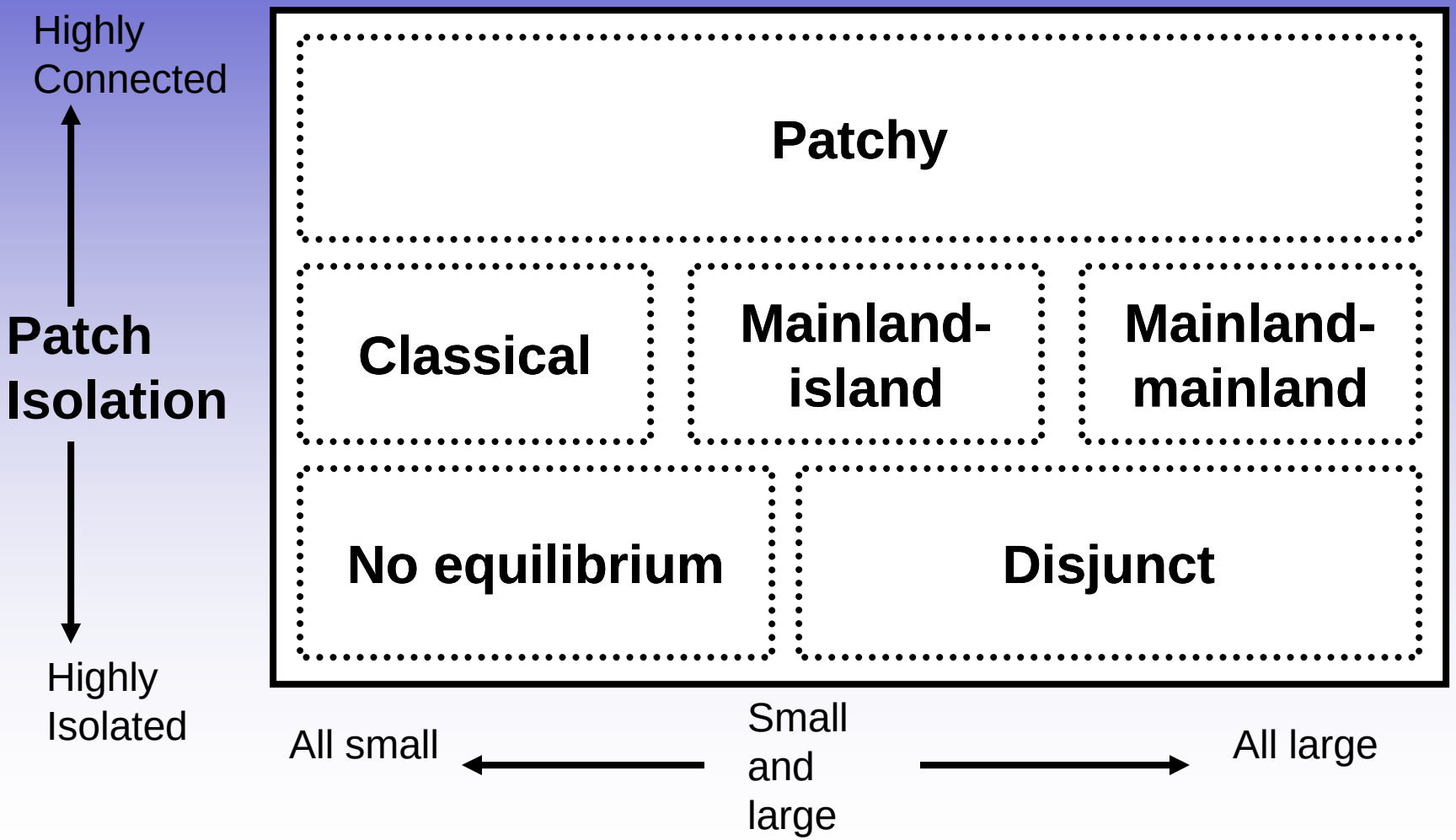


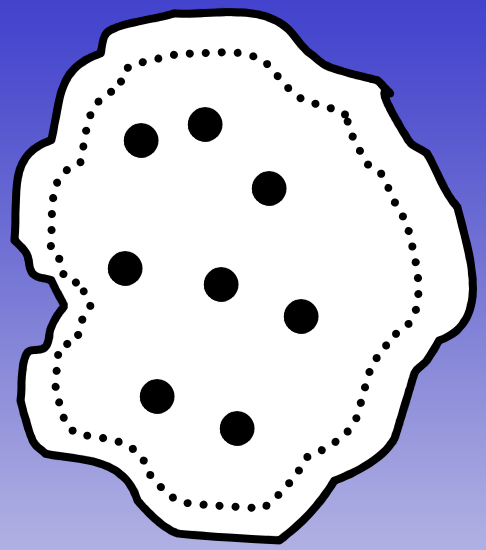
$p = 0.33$

Panmictic

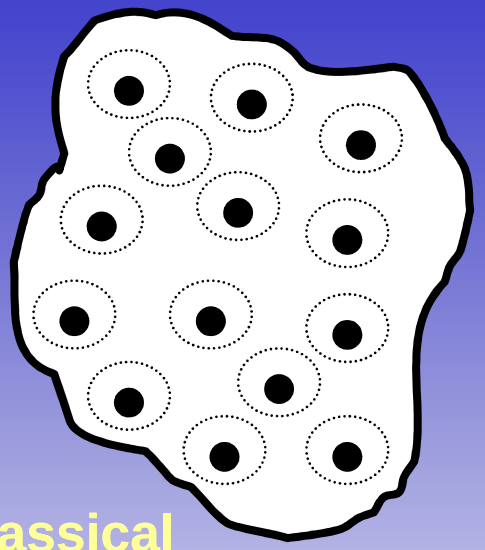
Levins Metapopulation

Classification of Metapopulation (Harrison, 1991)

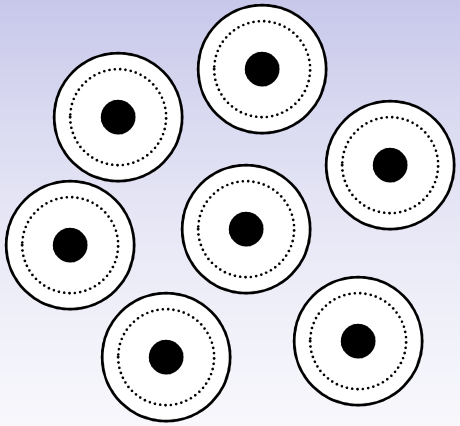




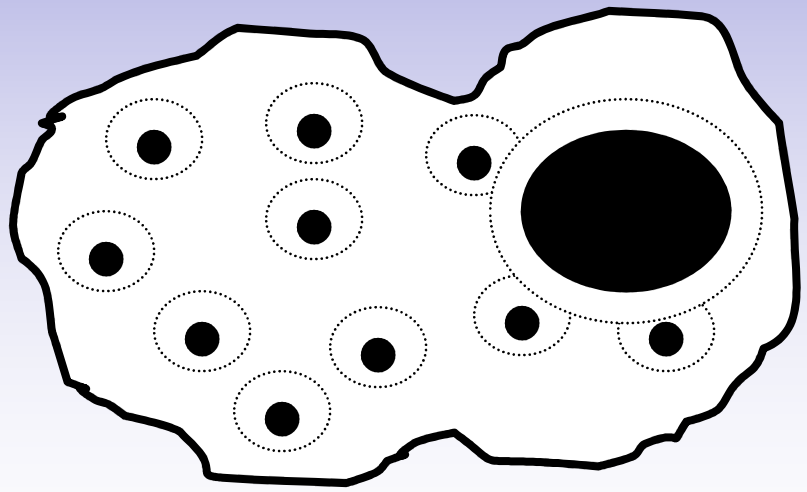
a. Patchy



b. Classical



c. Nonequlibrium



d. Mainlad-island

Why Genetics is Important?

1. **Fundamental theorem of natural selection:**

   loss of genetic diversity reduces future evolutionary options.
2. **High genetic variation within populations positively related to fitness.**
3. **Global pool of genetic diversity represents all of the information for all biological process.**

Small Population and Genetic Diversity

a. Genetically effective population size (N_e)

$$N_e = (4\ N_m\ .\ N_f)\ /\ (N_m + N_f)$$

b. Minimum Viable Population Size (MVP)

→ Shaffer (1981)

c. Minimum Dynamic Area (MDA)

Genetics in Primates Conservation

A. Inbreeding

B. Bottlenecks

C. Founder Effect

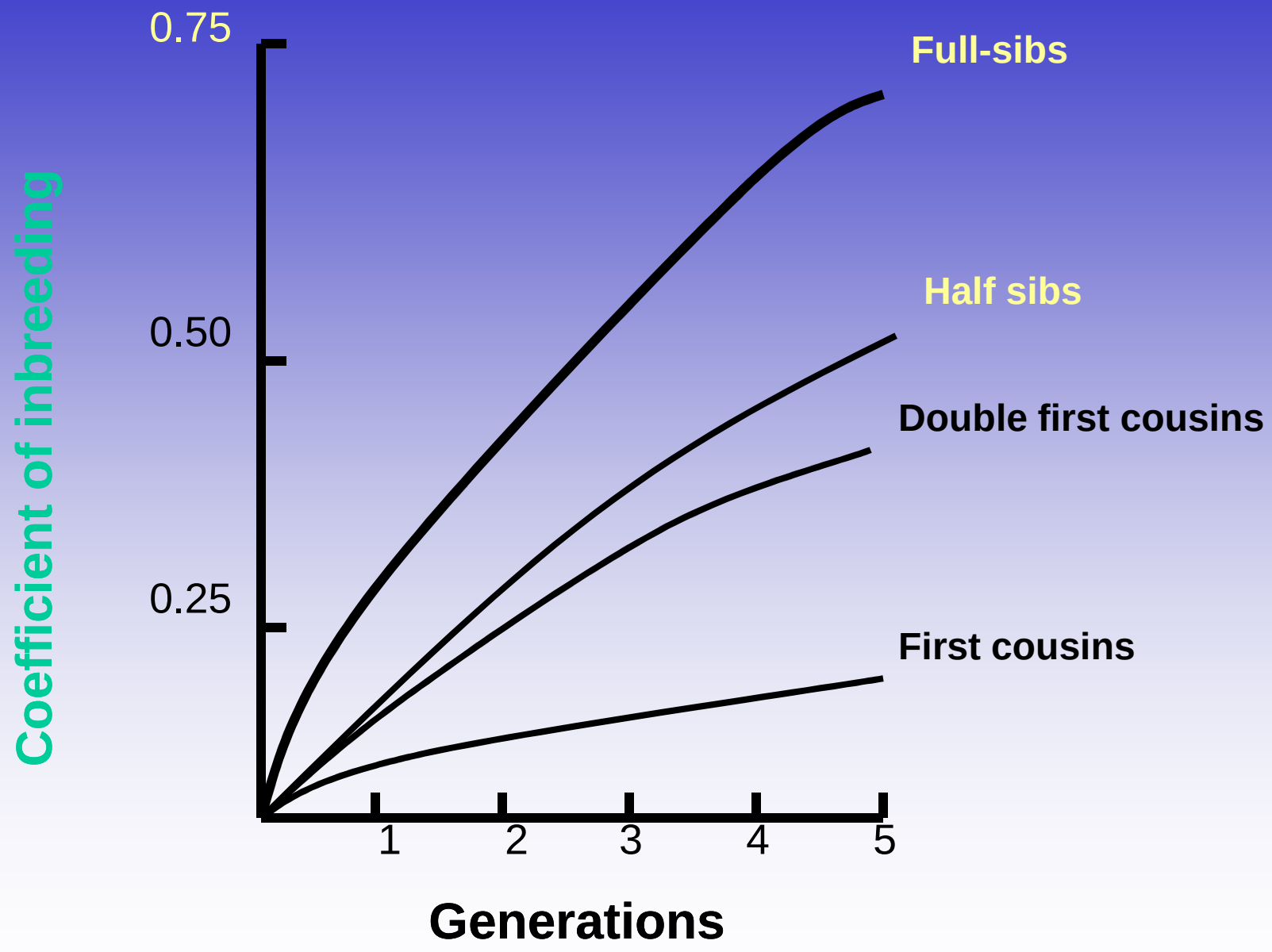
D. Genetic Drift

A. Inbreeding

- Inbreeding: mating of close relative individuals.
- Share some their genes because they have one or more ancestors in common.
- Measure of inbreeding: Inbreeding Coefficient of Wright (1931) ⟶ *F*

Loss of heterozygosity inter generation:

$$\Delta F = \tfrac{1}{2}\,Ne = 1/8\,N_m + 1/8\,N_f$$



Inbreeding ⟶ causes a change or shift in the means of some genetically determined quantitative characters

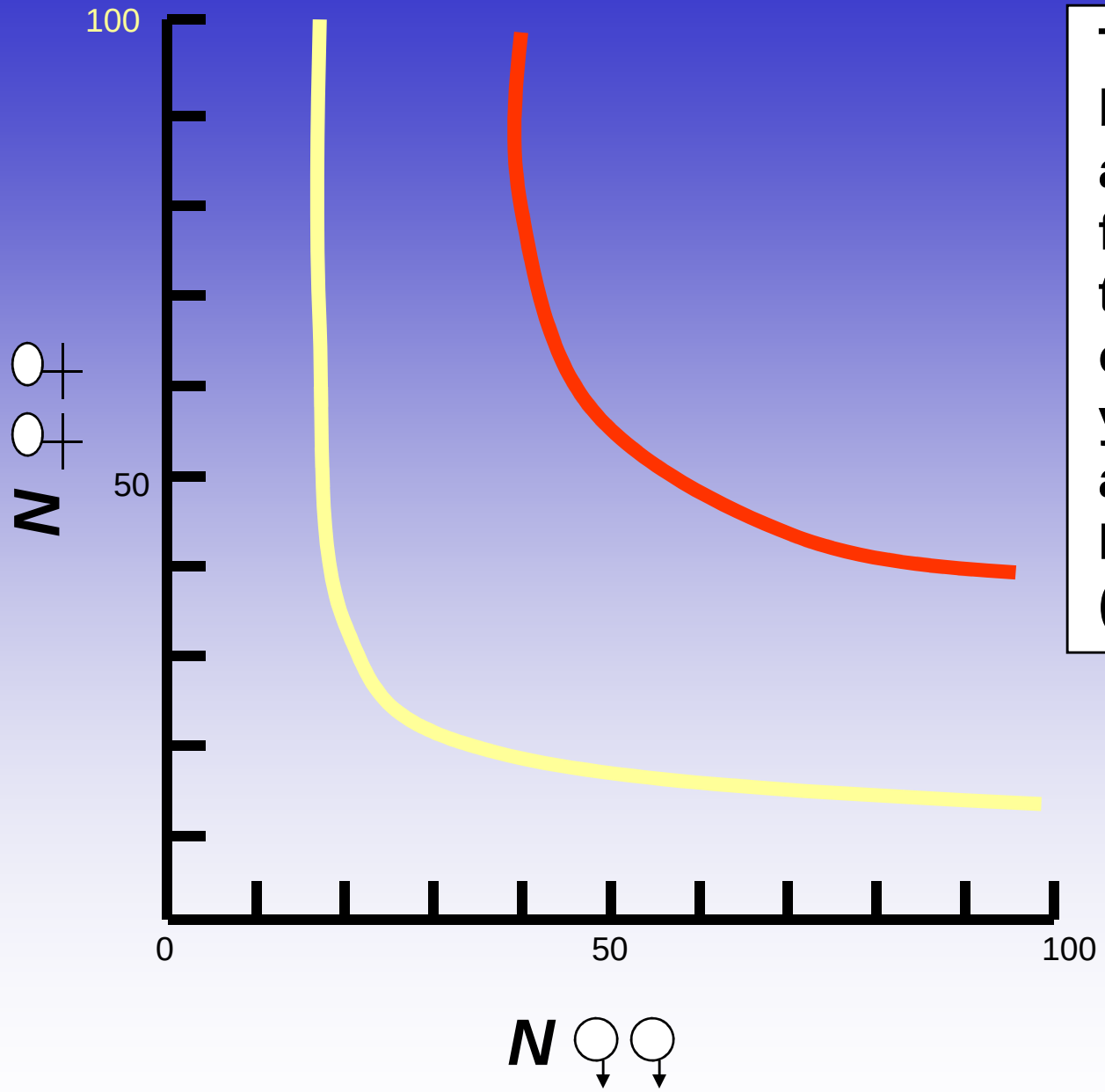
↓

Directional shift:

Towards the direction of the phenotype expressed by homozygous recessive alleles

↓

“Inbreeding depression”

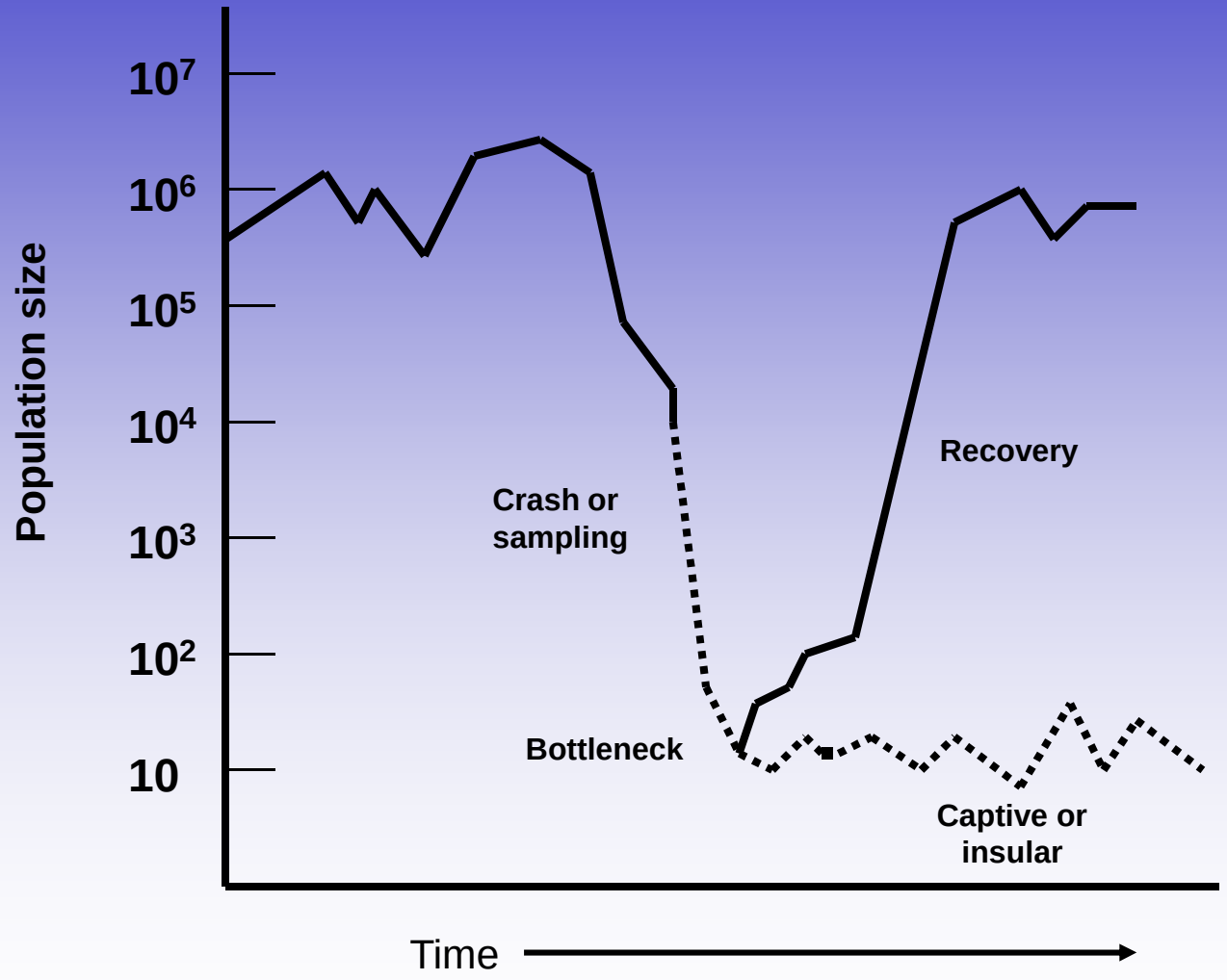


The number of breeding males and breeding females needed to satisfy the 1% or N_e = 50 (the yellow region) and the 0.5% 0r N_e = 100 criterion (the red region)

B. Bottlenecks

An Observable and dramatic collapse of numbers

The kinds of change in population size relevant to conservation genetics.



Bottlenecks

- ✓ Small samples of generarely are completely representative of the source population
- ✓ The proportion of genetic diversity remaining from one generation to the *t* generation:

Proportion: $(1 - 1 / 2 N_e)^t$

→ range from 0,5 to 1,0