

TRANSMISSION BIAS

"EVOLUTION IS ALL ABOUT GENETIC ACCOUNTING"

AUTOMATIC
SELECTION
OF A
SELFING
SELECTION

CONSIDER A POPULATION OF
OUTBREEDING POPULATION.
ON AVERAGE, ONE SET OF SEED
WILL GO THROUGH A MATERNAL
LINE (SEED) AND ONE SET
THROUGH A PATERNAL LINE (POLLEN)

	OUTCROSSER ✓	SELFER ✓
SEED	1	2
POLLEN	1	1
TOTAL GENE COPIES	2	3

SELFING FORM HAS A
TRANSMISSION ADVANTAGE.

THE ARGUMENT, HOWEVER,
IS ALL ABOUT THE QUALITY,
NOT QUANTITY.

THERE IS ENOUGH INBREEDING
DEPRESSION TO DECREASE
THE FITNESS.

GEOGRAPHIC VARIATION
LANDSCAPE AS A
FACTOR OF SPECIATION

ILLOCUTIONAL
POLYMORPHISM

GENE FLOW?

IS THE VARIATION ADAPTIVE

FISHER -
WRIGHT
DEBATE

WRIGHT SAW AN IMPORTANT
ROLE FOR POPULATION STRUCTURE
AND GENETIC DRIFT IN
EVOLUTION

FISHER DISAGREED AND
ARGUED THAT MOST EVOLUTION
OCCURRED IN LARGE
POPULATIONS BY NATURAL SELECTION

* NORTH-FACING SLOPES HAVE DIFFERENT
MICROCLIMATES

⇒ STEEP BOUNDARIES.

HOW DOES GENE
FLOW AFFECTS
VARIATION?

DEFINITIONS

POPULATION

A GROUP OF INDIVIDUALS OF A SINGLE
SPECIES OCCUPYING A GIVEN AREA
AT THE SAME TIME

MIGRATION

THE MOVEMENT OF INDIVIDUALS FROM
ONE POPULATION TO ANOTHER

GENE FLOW

THE MOVEMENT OF GENES FROM
ONE POPULATION TO ANOTHER

NOTE

POPULATIONS OF PLANTS AND ANIMALS
ARE DIFFICULT TO ESTIMATE.

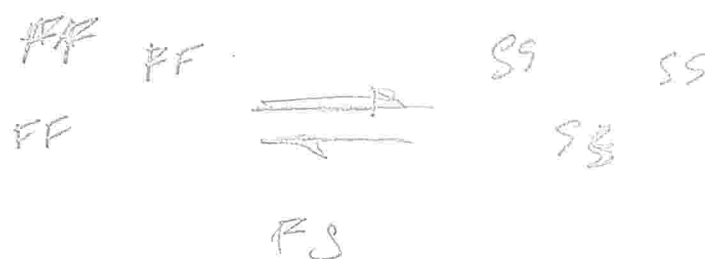
(e.g. MARK-RECAPTURE STUDIES)

HOW TO MEASURE GENE FLOW?

PROBLEM

- DIFFICULT TO OBSERVE AND MEASURE
- DISTINGUISH POTENTIAL VS ACTUAL
- DISTINGUISH GAMETE VS POPULATION
- USE NEUTRAL GENETIC MARKERS

USE
ELECTROPHORESIS
GEL TO ESTIMATE
THE FREQUENCY
OF HETEROZYGOTES
AS AN estimate
OF GENE FLOW

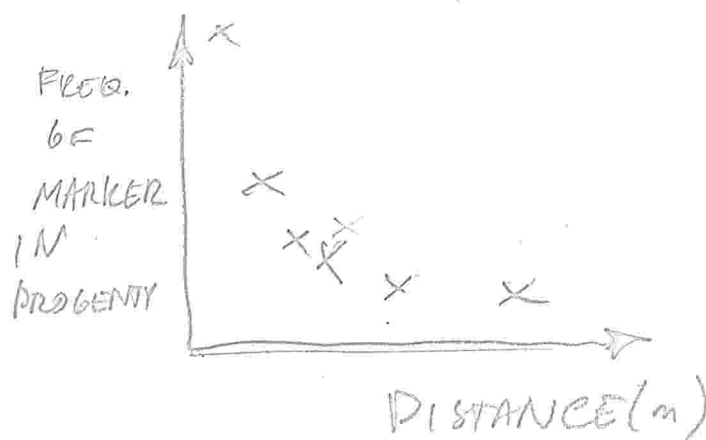


APPLICATION TO GMO

→ FERTILISATION BETWEEN GMO AND NON-GMO CROPS

RECOMBINANT DNA TECHNOLOGY
AS A METHOD OF GENE FLOW

GENE FLOW BETWEEN
CROP AND WEED
UNFLOWERS



GENES MOVE IN DIPLOID
OR HAPLOID FORMS,

Q'S ABOUT
VARIATION
WITH POPULATION

HOW MUCH OF THE OBSERVED
VARIATION IS GENETIC?

DOES THE VARIATION CONTRIBUTE
TO FITNESS DIFFERENCES

GEOGRAPHIC
DIFFERENTIATION

Q WHAT PROPORTION OF
ALL GENETIC VARIATION IN
A SPECIES IS DUE TO
DIFFERENCES BETWEEN
POPULATIONS

— HOW IS DIVERSITY
DISTRIBUTED WITHIN VS
BETWEEN POPULATIONS?

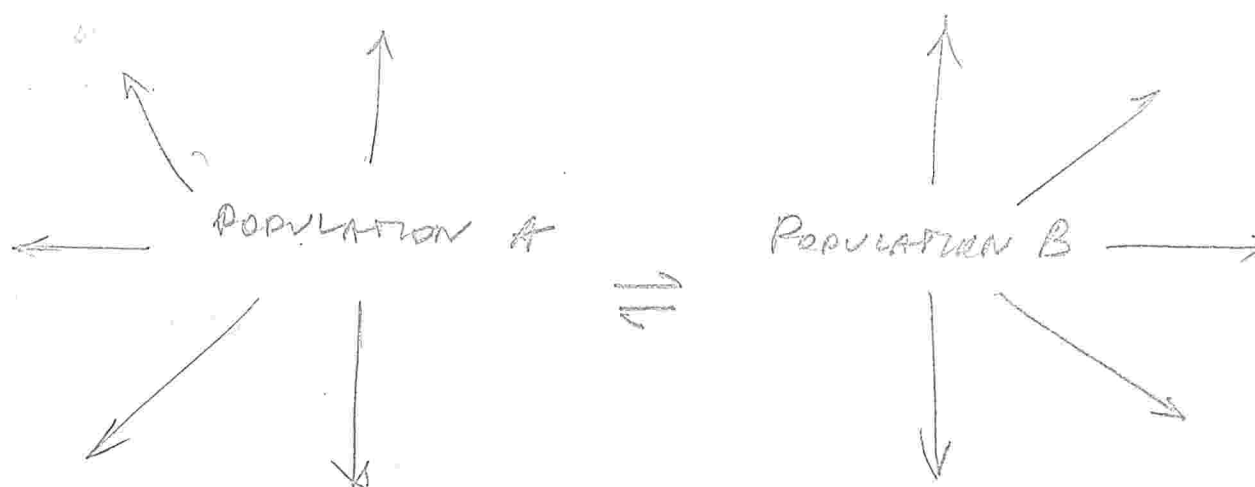
EXAMPLE

→ HUMANS

FULLY INTERBREEDABLE
BETWEEN DIFF. LOC.

EFFECTS OF SELECTION,
GENE FLOW & GENETIC
DRIFT ON POPULATION

DIVERGENCE



ESCAPE OF CROP TRANSGENS INTO WILD
RELATIVES BY GENE FLOW

RISK

ASSESSMENT:

- PROXIMITY OF WILD RELATIVES
- POLLINATION SYSTEM - WIND VS ANIMAL
- MATING SYSTEM - SELFER VS. OUTCROSSER

HIGH RISK

WIND POLLINATED OUTCROSSER WITH
RELATIVES NEARBY

LOW RISK

SELFER CULTIVAR NO RELATIVES
NEARBY

GENETIC DRIFT

RANDOM COMPONENT
IN EVOLUTION

- MUTATION
- RECOMBINATION
- GENE FLOW (DEPENDS ON
THE PARAMETERS)
- GENETIC DRIFT

DETERMINISTIC PROCESS

NEW HYPOTHESIS

- NATURAL SELECTION

LOSS OF DIVERSITY DUE TO STOCHASTIC PROCESSES:

- GENETIC DRIFT
- POPULATION BOTTLENECK
- FOUNDER EVENTS: COLONIZATION BY A
FEW INDIVIDUALS THAT
START A NEW POPULATION
WITH ONLY LIMITED
DIVERSITY COMPARED WITH
THE SOURCE POPULATION

CAN GENETIC DRIFT
BE IMPORTANT
FOR ADAPTATION

↓ TRISTYL - A PLANT SERVICE
POLYMORPHISM

	LONG	MID	SHORT
10 years OF RESEARCH	SSMM	SsMm	SsMM
→ BRIAN HUSBAND			
→ MARTIN MORGAN			

TWO DIALLELIC LOCI WITH EPISTASIS BETWEEN S AND M.

DEFINITION

INTERACTION BETWEEN ALLELES
AT DIFFERENT LOCI AFFECTING
PHENOTYPE

→ POLYMORPHISM BETWEEN ALLELES AT
DIFFERENT LOCI AFFECTING PHENOTYPE

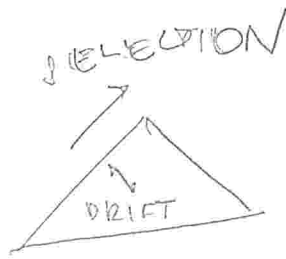
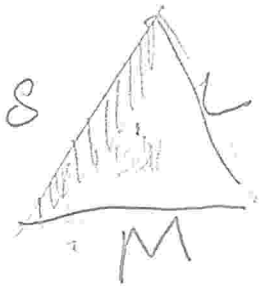
FISHER

1:1:1 morph FREQUENCIES AT
EQUILIBRIUM

THEORETICAL

THEORETICAL: "INDEPENDENT" MATING = 6-
GENETIC DRIFT
EFFECTIVE POPULATION

ASYMMETRIC MORPHS?



IF THERE IS A INSUFFICIENT NUMBER OF
 POLLINATORS, SELFING IS BENEFICIAL TO

GENETIC DRIFT AND NATURAL SELECTION
 TOGETHER RESULTS IN THE EVOLUTION
 OF SELFING FROM OUTCROSSING.