The severity of inbreeding depression over seven years in the self-incompatible, long-lived plant, *Echinacea angustifolia*.

Ruth Shaw
Charles Geyer
Stuart Wagenius
Schiedea globosa

Gaillardia pulchella

Raphanus sativus
Echinacea angustifolia, purple coneflower

Asteraceae
long-lived
reproduces by seed
self-incompatible
non-specialized seed dispersal
generalist pollinators

Photo by S. Wagenius
Echinacea angustifolia DC. blacksamson echinacea
Sporophytic incompatibility (SI) bars production of seeds via
  - self-pollen
  - pollen from plant sharing either allele at the SI locus

Wagenius et al. 2007
Between fragments:

Within fragments, between heads:

Within heads:

Common field

Cross treatments
Fitness through age 5

1 → ss1 → ss2 → ss3 → s01 → s02 → s03 → s04 → s05

Aster models for life history analysis
www.stat.umn.edu/geyer/aster/
Geyer et al. 2007. Biometrika
Geyer et al. 4:30 today Anderson 230
Fitness through age 5

Progeny of sib mating ~ 40% lower fitness = $ID_S$
Fitness through age 7

1 $\rightarrow$ s01 $\rightarrow$ s02 $\rightarrow$ s03 $\rightarrow$ s04 $\rightarrow$ s05 $\rightarrow$ s06 $\rightarrow$ s07 $\rightarrow$ hdct05

Aster models for life history analysis
www.stat.umn.edu/\texttt{geyer/aster/}
Geyer et al. 2007. Biometrika
Geyer et al. 4:30 today Anderson 230
Mean Fitness through age 7

Expected number of flower heads

ID_s = 0.67

Cross distance
Photo taken at U.S. Botanic Garden

Schiedea globosa

Heywood 1993: $ID_{FS} = 0.22$

Gaillardia pulchella

Nason and Ellstrand 1995: $ID_{FS} = 0.58$

Raphanus sativus

www.sbs.utexas.edu/

www.missouriplants.com
• Inbreeding depression is becoming more severe as the cohort ages.
• Aster makes possible joint analysis of components of life history, quantifying fitness differences (including uncertainty in fitness estimates).
Acknowledgments

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Disruption of gene flow among fragments of a population…….

• promotes drift: deleterious alleles may become more common
• increases autozygosity → inbreeding depression
  
  • selection against recessive, deleterious alleles - ‘purging’

• facilitates adaptation to local conditions

How do these genetic processes interact with demography to affect individual fitness and the size and persistence of populations?
THE GENETIC FACTOR IN POPULATION ECOLOGY

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INTRODUCTION

The ecological problem of populations has to do with the numbers of animals and what determines these numbers. The genetical problem of populations has to do with the kind or kinds of animals and what determines kind. These two disciplines meet when the questions are asked, how does the kind of animal (i.e., genotype) influence the numbers and how does the number of animals influence the kind, i.e., the genetical composition of the population? These questions are as much ecological as they are genetical.
Mean Fitness through age 7

- Expected Number of Flower Heads

- Cross Treatment:
  - between fragments
  - within fragment
  - sib mated