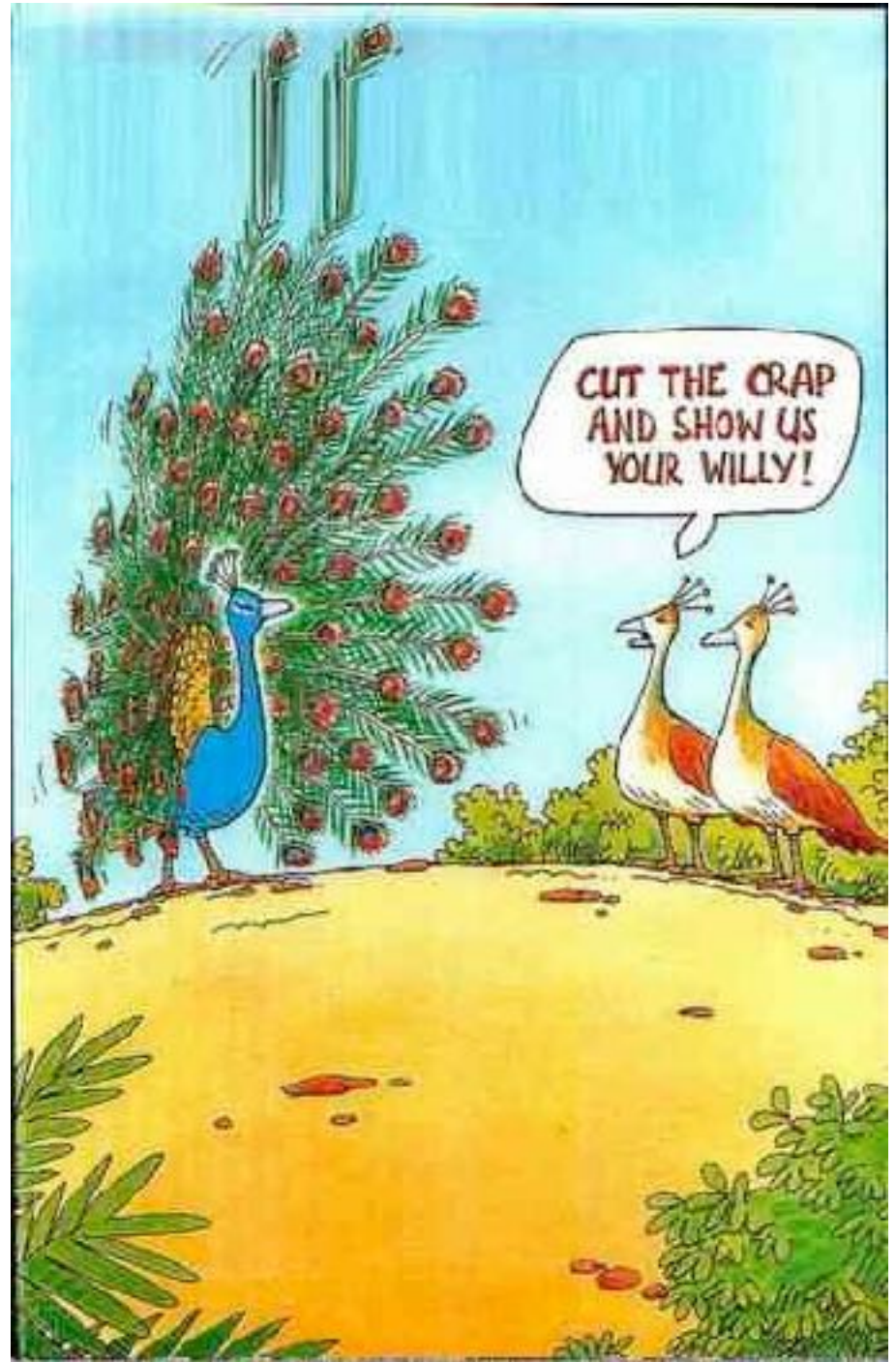


Reproduction & Sexual selection, part 1



Why is sexual repro often favored over asexual repro?

- Sexual reproduction
 - Reproduction that involves fertilization (combining of two gametes to form a zygote) to create new genetic combo
- Asexual reproduction
 - Does not involve new genetic combination
 - Not uncommon form of reproduction
 - Honeybees = haplodiploidy (males from unfertilized eggs)
 - Whiptail lizards = all females, but require 'courting'



Types of Asexual Reproduction

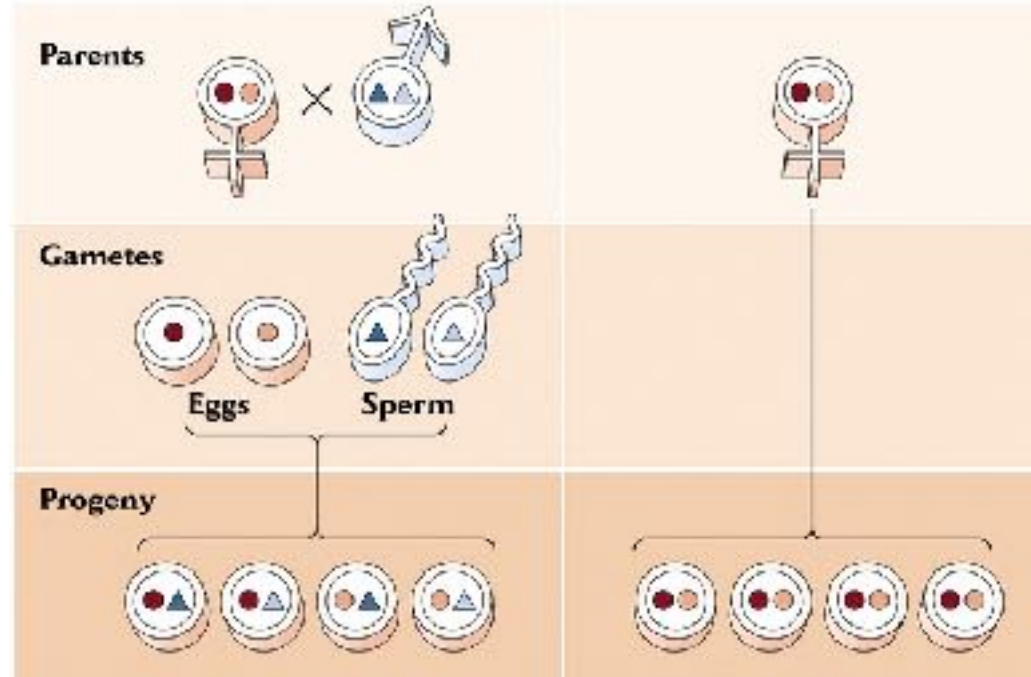
Parthenogenesis

http://www.youtube.com/watch?v=tWfgpHKP0_4

watch: 1:12-1:55

The costs of sex

- Costs
 - 1) Cost of meiosis (cost of making males)
 - Half as many genes contributed to next generation
 - » “Wasted resources” on males



The costs of sex

- Costs

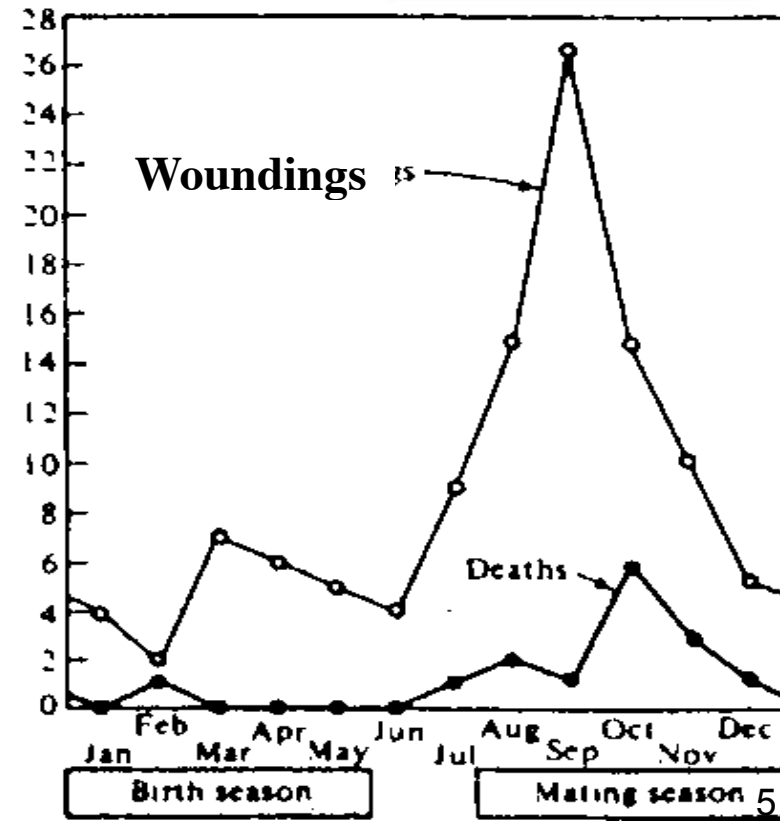
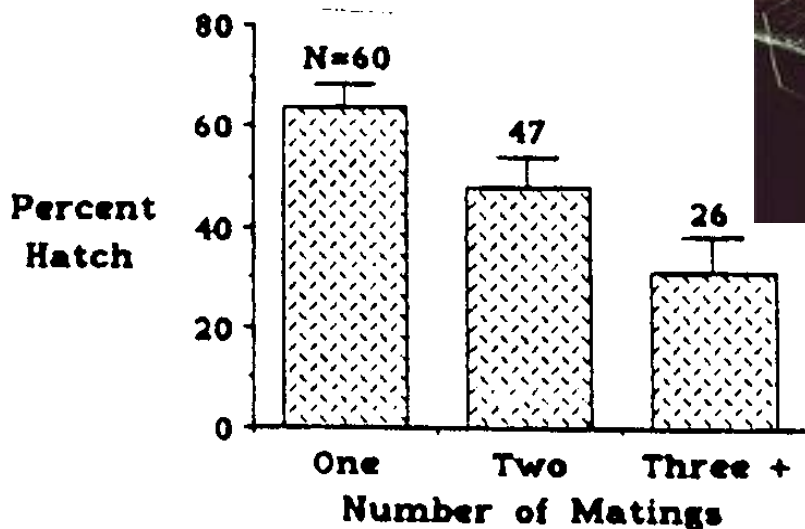
- 2) Cost of recombination

- Loss of beneficial local adaptations (co-adapted gene complexes)

- 3) STD's

- 4) Finding mate

- 5) Courtship



Benefits of sex

- HYP1) Removal of deleterious genes
 - Muller's ratchet: Deleterious recessive alleles build up over time, with no means to purge them
 - Sex allows independent assortment AND genetic recombination: reducing mutation load (or even creating disease-free genotypes)



Benefits of sex

- HYP2) Spread and creation of advantageous traits
 - Advantageous mutations can reshuffle into different individuals
 - Sex allows independent assortment and genetic recombination: which can lead to increased phenotypic variation in descendants



Benefits of variation in offspring

- How does variation increase fitness?

HYP2:A. Lottery Hypothesis

- Coping with an unpredictable environment
 - Temporal variation = seasonal availability of food
 - Spatial variation = patchy habitat
 - Elements



Benefits of variation in offspring

- How does variation increase fitness?

HYP2:B. Red Queen Hypothesis

- Coping with a **co-evolving *biotic*** environment
 - dealing with pathogens, parasites, predators and competitors

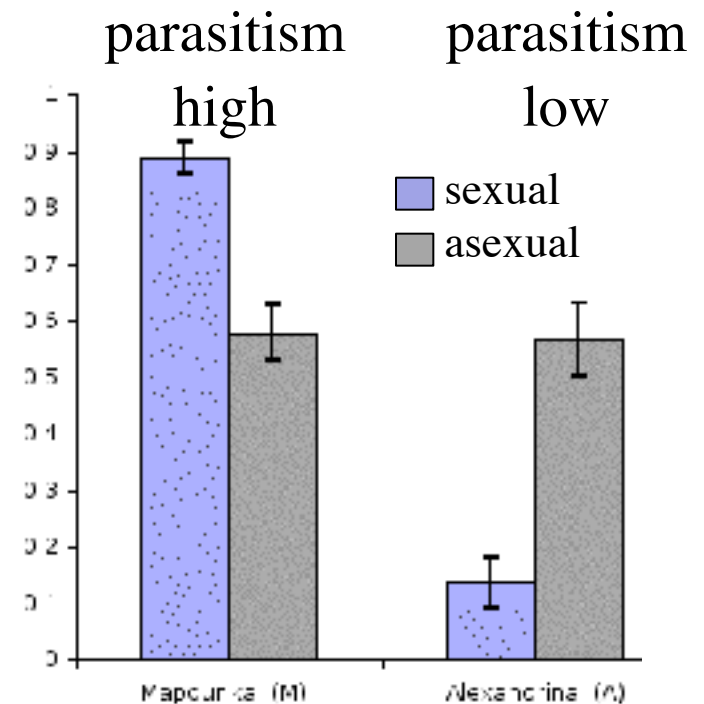


The Red Queen

- Dealing with pathogens, parasites, and predators
 - Antagonistic coevolution
 - Most common genotypes become disfavored
 - Favors constant and fast evolution of new genotypes

The Red Queen

- Dealing with pathogens, parasites, and predators
 - Antagonistic coevolution
 - Most common genotypes become disfavored
 - Favors constant and fast evolution of new genotypes
- Snails and parasites
 - Parasites adapt to local hosts
 - Sexual reproduction favored in areas with more parasites



Sexual vs. asexual reproduction

- In what environments do you find different types of reproduction?
 - Red Queen predicts more sexual repro in environments with both great biodiversity and interspecies interactions. These are more biotically (than physically) unpredictable

SEXUAL SPECIES

Marine
Large Lakes
Low latitudes
Low altitudes
Wet
Parasitic
Mainland

ASEXUAL SPECIES

Fresh Water
Small Streams
High latitudes
High altitudes
Dry
Free-living
Islands

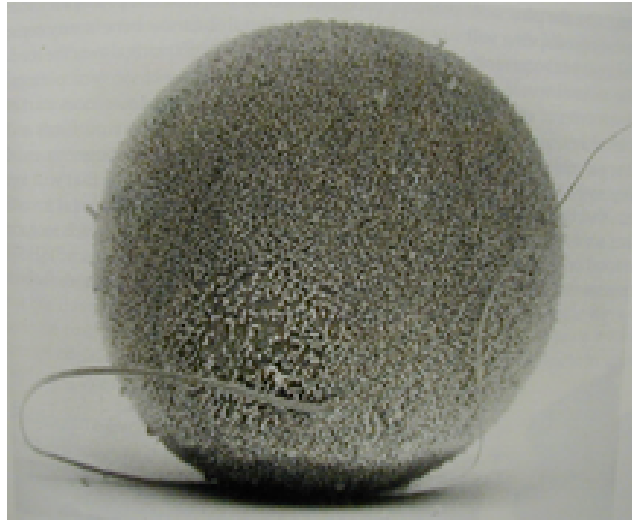
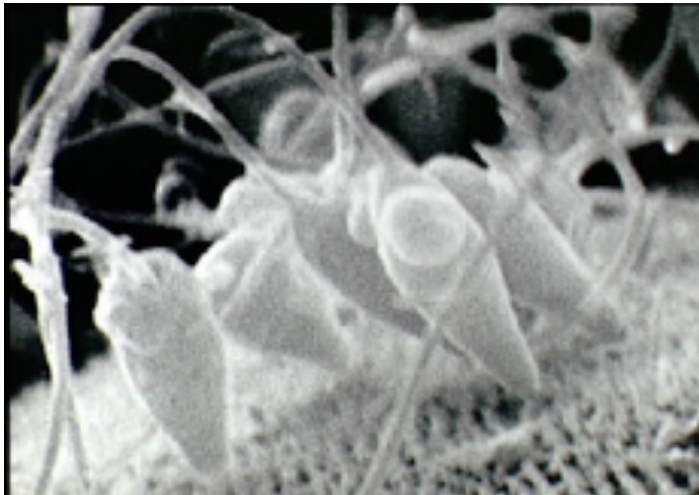


Males and females



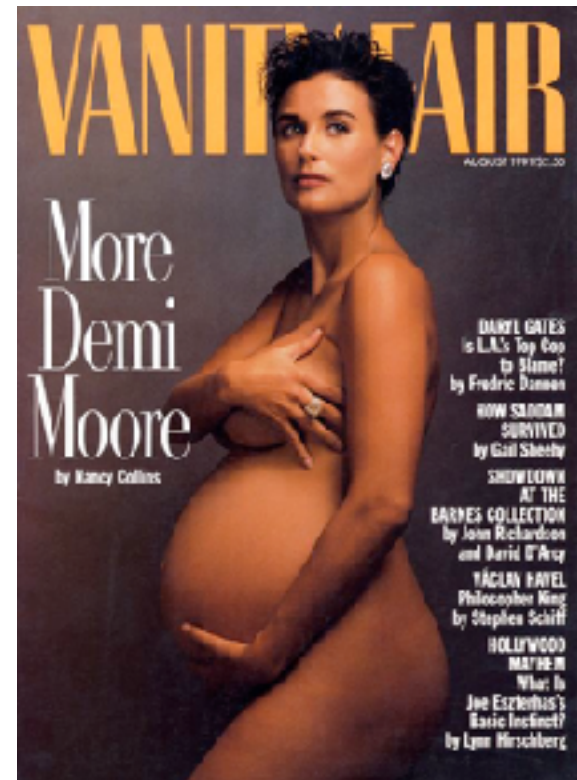
Males and females

- 1) Anisogamy = asymmetrical gamete investment
 - Females produce larger but fewer gametes (eggs)
 - invest lots of energy per gamete (15% bird body mass)
 - Males produce more small, mobile gametes (sperm)
 - invest little energy per gamete (8 billion in bird testes)



Parental investment

- When there is 1) Anisogamy, leads to:
 - 2) differences in parental investment
 - Females generally expend more time and energy
 - ex. Gestation and lactation in mammals



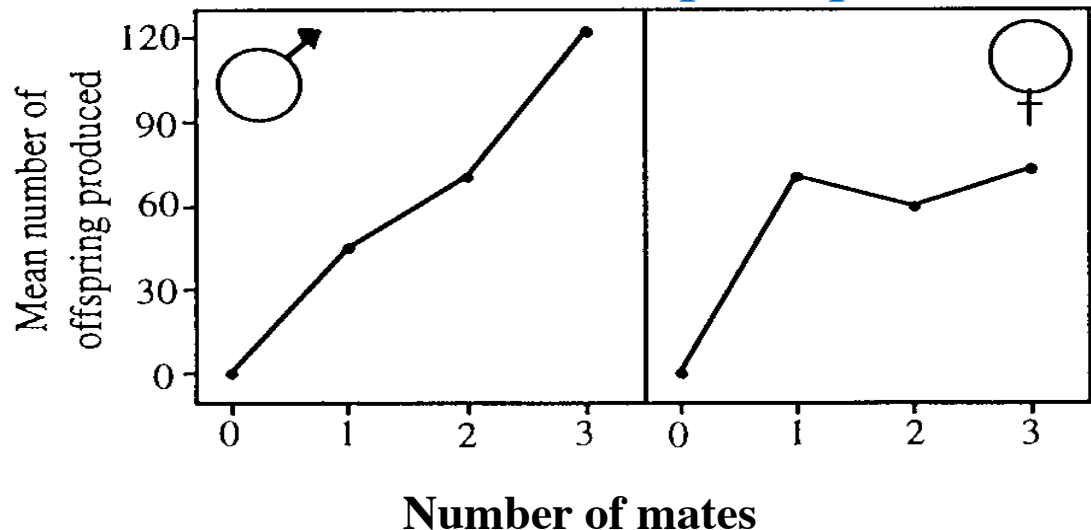
Reproductive rate

- When there is 1) Anisogamy, 2) differences in parental investment, leads to:
 - 3) Differences in potential reproductive rate
 - Males can fertilize eggs at faster rate than females can produce them (Male RS limited by access to females)
 - Female RS limited by resources (egg production, time, food)



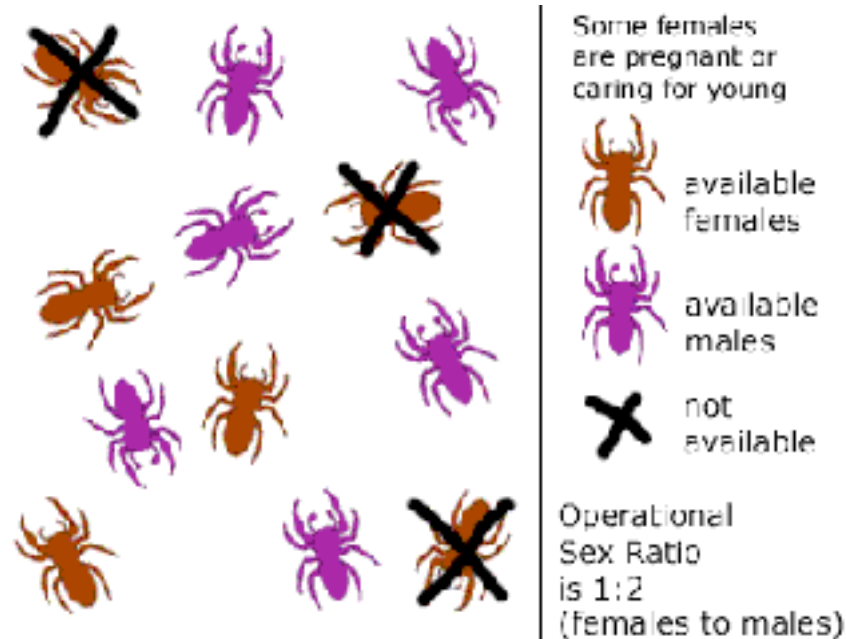
Drosophila

Bateman's principle



Why are females generally the choosier sex?

- When there is 1) Anisogamy, 2) differences in parental investment, 3) differences in potential reproductive rate, leads to:
 - 4) Differences in operational sex ratio
 - Ratio of sexually receptive males to receptive females
 - Typically: Females are limiting resource



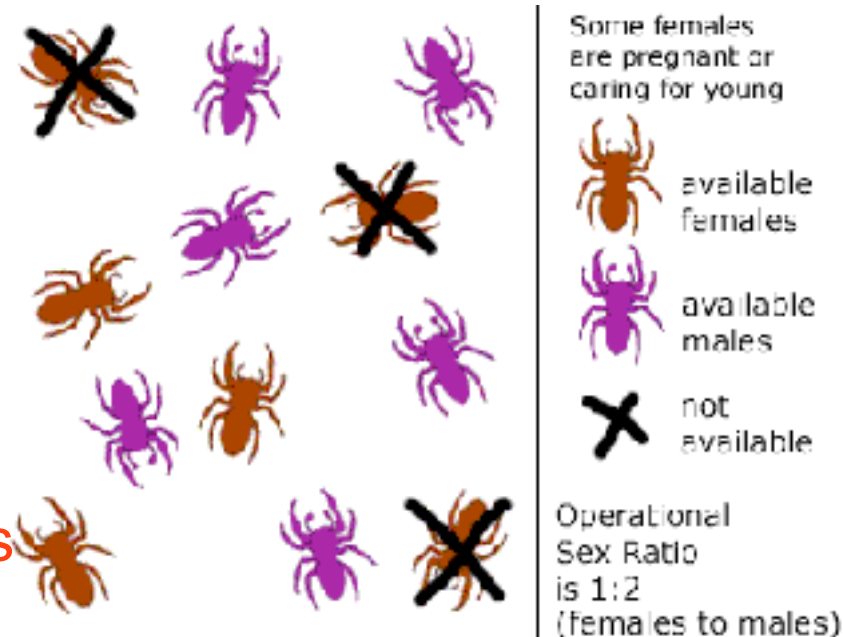
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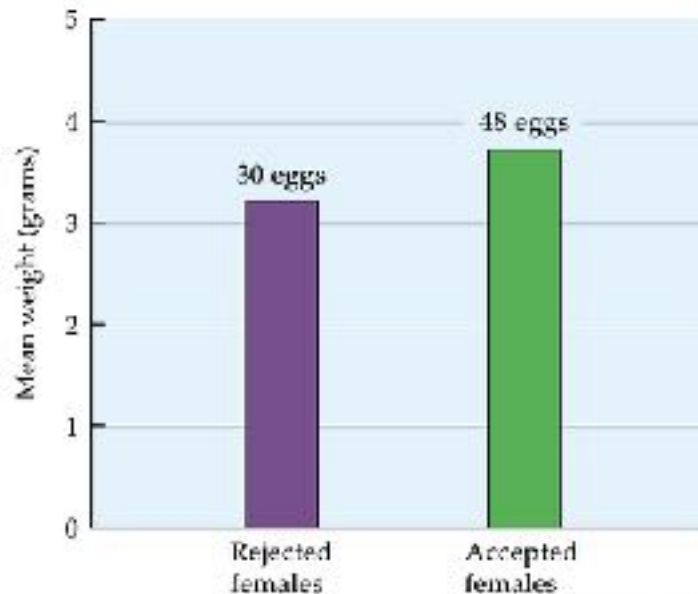
- Typically: Females are limiting resource

- **And thus: Males compete for access to females; females have many options so cost of choice is low**



Do females always choose males?

- NO! If males invest more in parental care, expect male choice
 - Bias towards male parental care
 - Male incubation = sex role reversal
 - Seahorses and pipefish
 - Nuptial gifts (large spermatophore)
 - Mormon crickets



Does only one sex choose?

- NO! When both sexes invest similar amounts in parental care, neither sex is limiting, so mutual mate-choice may be favored
 - equal competition by each sex for other's interest

