

Sexual Dimorphism

- The differences common between males and females of the same species (other than the obvious different reproductive structures)

How does this arise evolutionarily?



The problems that sexual selection solves:

- If the long tail improves survival or fecundity somehow, why do just males have it?
- How could those long feathers be helpful? They take energy to grow and they must make it easier for predators to catch the birds

A 3rd component of “fitness”

1. Surviving long enough to reproduce
2. Successfully reproducing
3. With sex, you also have to add finding a significant other and getting them to cooperate

Natural vs. Sexual Selection

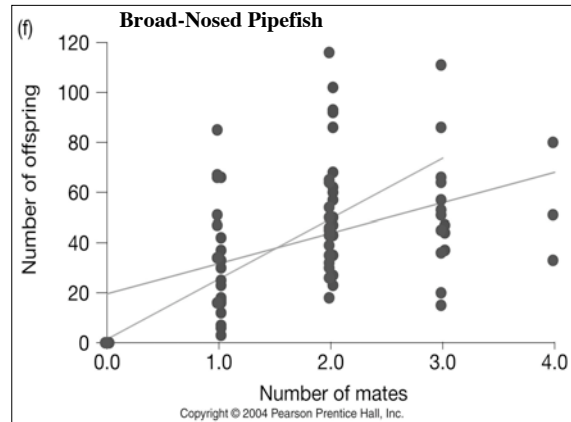
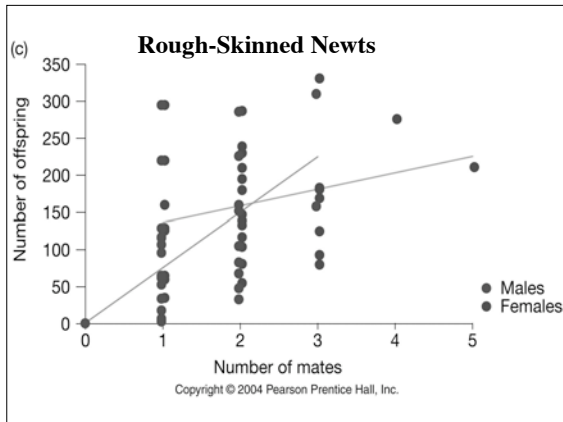
- Natural Selection is differential reproductive success due to variation among individuals in survival and reproduction
- Sexual Selection is variation in success getting mates--the traits that improve this success should become more common over time

Asymmetries in Sexual Reproduction

- If sexual selection explains sexual dimorphism, it must act differently on the sexes
- It does because **parental investments** are different
 - Investment costs the parent’s fitness, but increases the offspring’s fitness
 - Typically the mom pays the bigger price

Fitness....

- Males: driving selective force is to improve his chances of mating
 - Females: limited by the number of offspring they can physically produce
- Therefore, sexual selection (variation in mating success is a more potent evolutionary force for males than for females



Behavioral Consequences

1. Males should be competitive among themselves for opportunities to mate
 2. Females should be choosy: any mating may involve a big investment on her part, so she should be selective about it
- (there are exceptions so these aren't inherent in the identity of the sexes)

1. Intrasexual Selection

- The key event that determines reproductive success involves interactions between members of the same sex
- Males fight for direct control of females, control of a resource vital to females (feeding territory, nesting site), or just fight and females mate with the winners

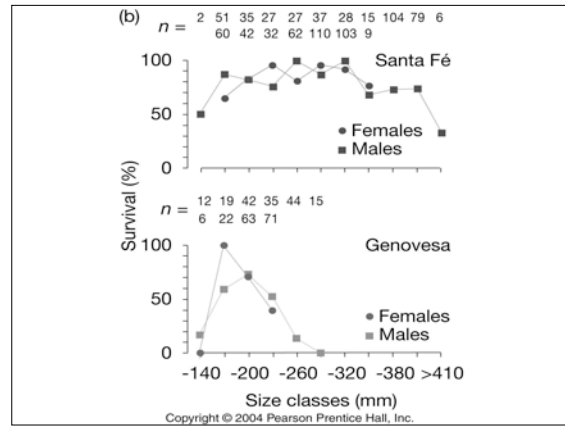
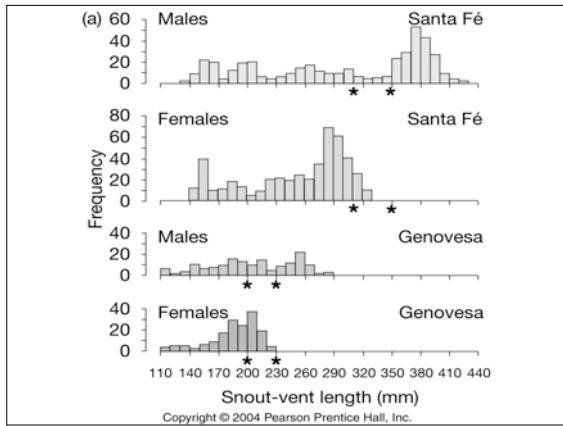
2. Intersexual Selection

- The key event that determines reproductive success involves interaction between members of the two sexes--females choose males
- Males advertise by singing, dancing, or showing off bright colors and the females choose the ones with the best display

Intrasexual Selection: Combat

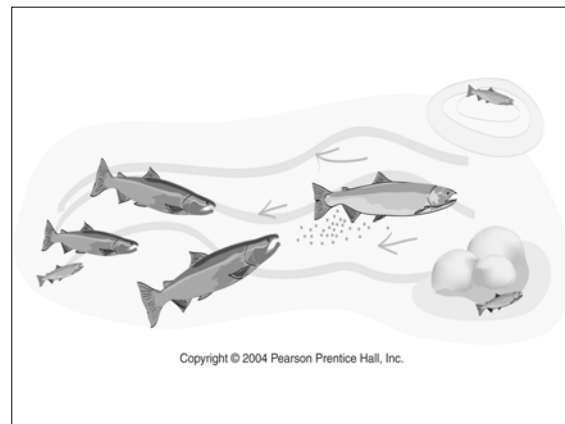
- This is the most obvious form of competition
- Favors traits like large size, weaponry, armor, or tactical cleverness





Is this Sexual Selection?

- Females dig nests and lay eggs
- They breed once per breeding season
- They prefer males with bigger territories
- Males produce sperm
- Breed as much as possible per season
- Start by staking out and trying to hold territories
- Bigness helps



If there's Sperm Competition:

- Deliver a lot of sperm (previous bat example, fruit flies)
- Guard your mate
- Prolong copulation
- Deposit some sort of plug
- Apply pheromones to reduce female attractiveness
- Damsel fly example

Infanticide

- Lions:
 - Males kill rival cubs making females receptive to mating sooner
 - Females sometimes fight back, though it rarely works, or spontaneously abort---sort of cut their losses before investing too much



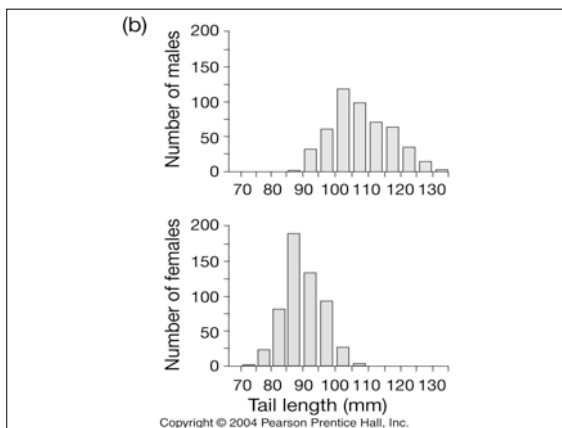
Intersexual Selection: Female choice

- First proposed by Darwin in 1871...took awhile

Some examples.....

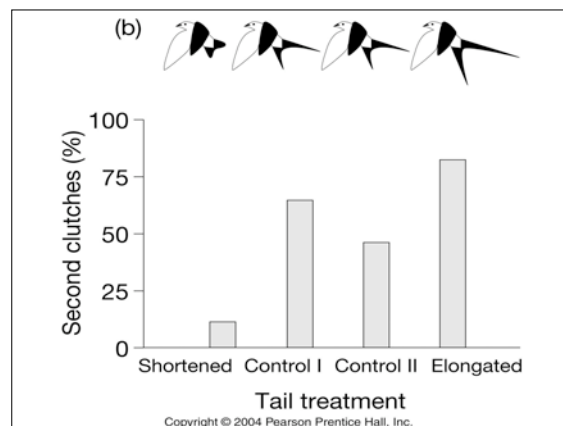
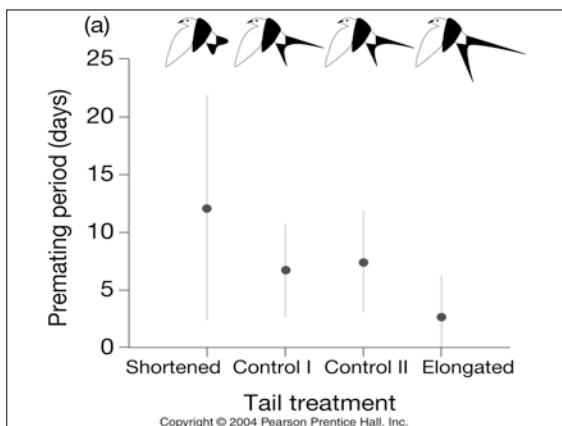
Barn Swallows

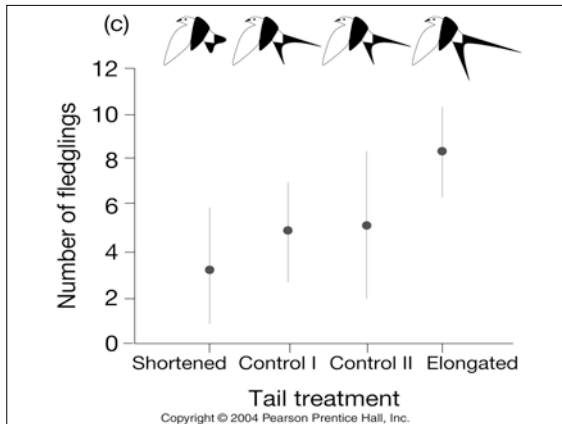
- Live in colonies up to 80
- Males select individual territories and display to attract females
- Females visit around, select a male
- The both build the nest, female broods, and they both feed the offspring
 - Parental investment isn't too different so...



Why are they different?

- Even in monogamy, you want the best possible mate so there are selective pressures
- Also they aren't entirely monogamous
- The trait that is most different--the tail--is the very one used to attract the females





Are male displays indicators of genetic quality?

- In gray tree frogs, females prefer the males with the longest songs
- In fact, when eggs from a single female were fertilized with sperm from a long-song and a short-song male, the longer song offspring were more robust

Females might gain resources directly

- Hanging fly males catch an insect gift to attract a female
- The longer she eats, the more sperm she accepts up to 20 minutes at which point she breaks off copulation and goes to find another male and meal

Females prefer big meals:

1. Gets more nutrients so she can lay more eggs
 2. Saves her from having to hunt; males are twice as likely to be caught in spider webs
- On the other hand, if the female is still eating after the male has deposited all his sperm, he takes off to share his insect with someone else

Females might have a pre-existing sensory bias

- Females use their senses for other things besides mate selection, and natural selection on those traits might result in biases toward cues that otherwise have no relation to mating or fitness
 - Ex: water mites

Sexy Son Hypothesis

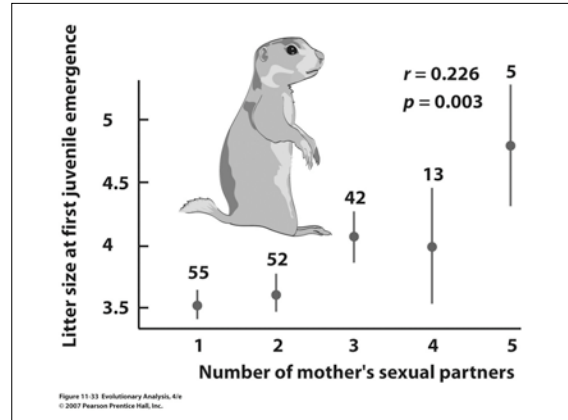


- Once a particular male trait is favored by a majority of females, selection on females reinforces the preference for the fashionable trait
 - Females choosing fashionable mates will have more fashionable sons and therefore more grandchildren than females choosing unfashionable mates
 - Ex: spotted cucumber beetles and their fast stroking antennae

Diversity in Sex Roles

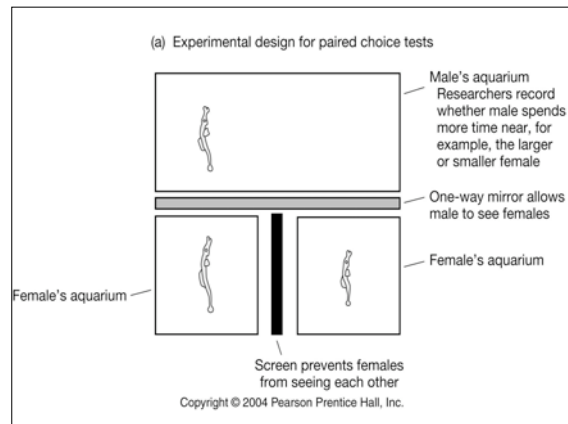
- Prairie dogs females are promiscuous
- And in the pipefish, if our theory of sexual selection is right, the roles should be reversed: females try to mate as much as possible and males are selective

Does the same thing happen for both?

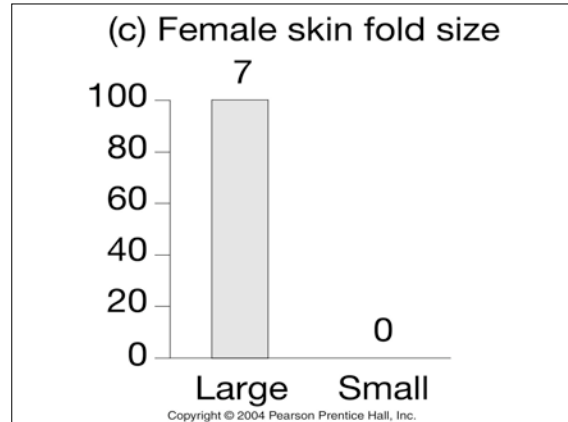
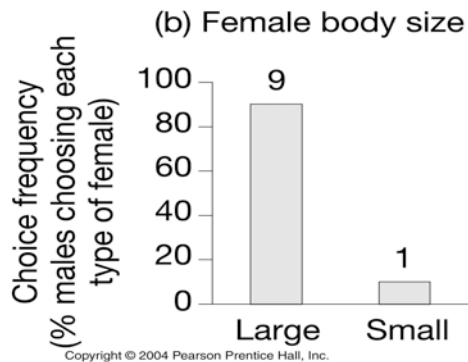


Evidence?

- Females are larger
- Females have blue stripes and skin folds that males lack
- The skin folds only show up during the breeding season, or in captivity when males are present



Nerophis ophidion



Sexual Selection in Plants

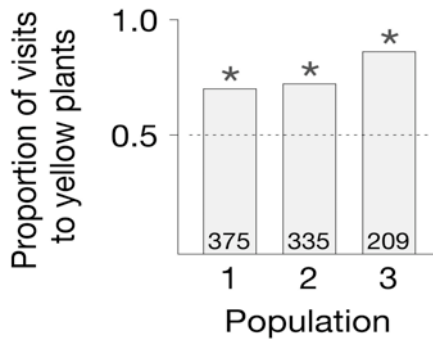
- Many plants show sexual dimorphism with male and female flowers, for example, being different
- Pollen is less trouble to produce and release than having to grow a fruit
- If pollen is transported by animals, a plants access to mates is a function of its access to pollinators

Therefore....

- Access to pollinators should limit reproductive success of pollen donors (males) more than it limits the reproductive success of seed parents (females)

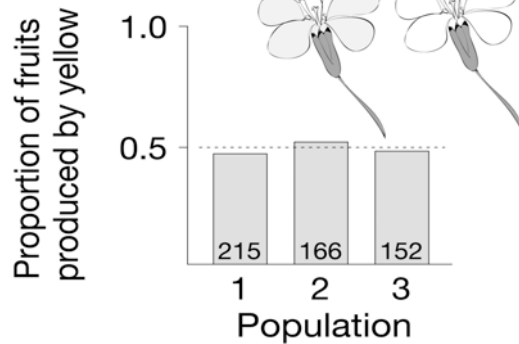
Is this the case? Ex: wild radishes

(a) Pollinator discrimination



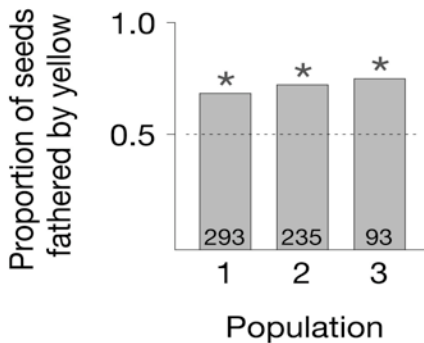
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(b) Maternal function



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(c) Paternal function



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Flowers

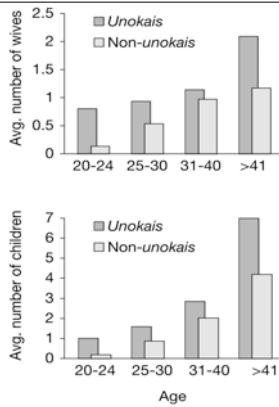
- You'd expect the evolution of showy flowers to attract pollinators was driven more by their effect on male reproductive success than on female
- In animal-pollinated plants with sexually dimorphic flowers, investment by the males in number of flowers and strength of odor is typically higher

Body Size in Humans

1. Human behavior is driven by a complex combination of culture and biology
2. You can't really experiment on humans so you're limited to observational studies which identify correlations but don't show cause/effect

Do human males compete?

- Men kill men much more often than women kill women--the closest comparison showed 85% of same-sex killing was done by men
 - The killers tend to be in their teens, 20's, and 30's
- Is this a manifestation of sexually selected competition?



Could the size difference be the result of female choice?

- Taller men tend to have more wives and children although differences are slight

What about women's heights?

- Selection for women's heights seems to be more stabilizing
 - Women of average height tend to have more children than those very tall or very short
 - Women of average height also tend to be healthier on average
- This looks like natural rather than sexual selection