Polygamy Favored

- Biparental care not mandatory
- Food super-abundant
- Resource abundance varies spatially & temporally

Environmental Potential for Polygamy

- Distribution of resources or mates
- Spatial & temporal distributions

Resource Defense Polygyny

- ♂ + ♀♀
- ~8% of species
- Passerines, dabbling ducks
- Why would a female settle on a territory of a male who already has a mate?

Female "chooses" polygyny!

Do females always benefit from being mates of polygynous males?

- Female reproductive success is maximized by having a monogamous mate
- Male reproductive success is maximized by having more than one mate
Discrepant pay-offs lead can lead to **Mate Defense Polygyny**

- Northern pintail
- Males defend females

<table>
<thead>
<tr>
<th>Male Pintail</th>
<th>Female Pintail</th>
</tr>
</thead>
</table>

**Resource Defense Polyandry**

- ♀ + ♂♂
- <1% of birds
- Shorebirds
- Why would males assume nearly all parental care?

<table>
<thead>
<tr>
<th>Wattle Jacana</th>
<th>Spotted Sandpiper</th>
</tr>
</thead>
</table>

**Mate Defense Polyandry**

- Phalaropes
- Females defend males
- Sequential polyandry

**Promiscuity (leks) Favored**

- Biparental care not mandatory
- Food delivery/predator vigilance not necessary
- Food super-abundant

Why congregate at leks?
- Predator avoidance
- Hot-shot hypothesis
- Hot-spot hypothesis
- Cooperative leks
**Male Dominance Promiscuity**

- Lek
- Multiple arenas with males displaying to females
- No resources at lek

**Why do leks form?**
1. Hotspot model
2. Hotshot model

**Polygynandry**

- European Dunnock
- Female territory overlaps with alpha♂ and beta♂
- Males care for young in proportion to copulations
- Males overlap with multiple ♀♀

"Unobtrusive, quiet and retiring, without being shy, humble and homely in its deportment and habits, sober and unpretending in dress, while still neat and graceful, the dunnock exhibits a pattern which many of a higher grade might imitate, with advantage to themselves and benefit to others through an improved example."

- Reverend F.O. Morris (mid-1800's)

**Mating System Summary**

<table>
<thead>
<tr>
<th>Duration of Pair Bond</th>
<th>Parental Care</th>
<th>Extra-pair Matings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td>Bi-parental</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Transient</td>
<td>Uni-parental</td>
<td>Common</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mating System</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanence</td>
<td>Polygyny</td>
</tr>
<tr>
<td>Transience</td>
<td>Polyandry</td>
</tr>
</tbody>
</table>
**“Cooperative” Breeding**

- “Helpers at the nest”
- 300+ species
  - Babblers, woodpeckers, corvids, wrens, bee-eaters, etc.
- Tropics, Australia, less in North America
- Non-breeding helpers
- Communal breeders

**Florida Scrub Jay Background**

- Occupies scrub oak woodlands
- Non-migratory population
- Long-lived, monogamy
- Helpers:
  1. Assist ~50% of breeders
  2. Number 1-6 individuals
  3. Assist for 1-5 years
  4. Mostly are offspring of pair

**How do Helpers Help?**

- Individuals additional to the female-male pair assist in raising young at the nest
- Feed young
- Act as sentinels
- Defend territory or resources

**Kin Selection**

- Inclusive fitness
- Natural selection can favor behaviors that benefit kin
- Shared genes with kin
- Evidence:
  1. Helpers do raise kin

**Sentinel Florida Scrub Jay**
Fitness Consequences of Helping?
- Pairs are benefitted by helpers
- Costs to having helpers?

Do Helpers Benefit from Helping?
- Fitness payoff to helpers
- Number of offspring raised as a helper vs. # as novice breeder
  - Therefore: $1.94 - 1.62 = 0.32$
  - Devalued by 0.5 owing to $\frac{1}{2}$ genes shared
  - Result: 0.16 young increase

What Benefits Might Helpers Accrue?
- Practice for novices
- Raise kin…shared genes

Communal Systems
- Acorn Woodpeckers
- Granaries = limited resource, long-term investment
- Sisters with dominance relationships
Communal System

- Red-cockaded Woodpecker
- SE United States
- Territorial clans with male offspring helpers
- Helpers: incubate, feed & excavate
- Nest tree center of activity
- Cavity bored in live pine
- Sap deters predators

The Evolution of Cooperative Breeding

- Ultimate explanation
- Two hypotheses
  1. Kin selection
  2. Ecological constraints

The Evolution of Cooperative Breeding

- White-fronted Bee-Eater
- Pygmy Nuthatch
- Wrentit

Avian Mating Systems: Conclusions

- Highly variable mating systems
  1. Among taxa
  2. Within species
- Expression of individual behaviors
- Influenced by environment
- Considerable conflict:
  1. Between genders
  2. Within sexes

Habitat limitation favors helping because:
1. Dispersal risk is high
2. Probability of territory establishment is low
3. Probability of finding a mate is low
4. Probability of breeding is low