Learning Objective

- In vs. out-group (PC)
- Social structure (PC)

6.1 Social Structure: stability/instability

Dr. Jane M. Packard
j-packard@tamu.edu

What is the difference? Territories vs. dominance

- Territories
  - Intense combat between SEVERAL groups - injury likely
  - H1: defense of space - group home range
  - H2: group access to resources
- Dominance
  - Minor conflict among individuals in ONE group - injury not likely
  - defense of personal distance within a group
  - individual access to resources (FP: “waiting in line”)

Common misperception that territoriality and dominance are the same thing; important to distinguish between the two concepts (different physiological basis)

NOTE: for solitary species, group size may be 1 individual (e.g. ocelot, bobcat, cougar)

Source: Trials of Life “Friends & Rivals”

H1: Stable group - trumpeter swan family fights other families

Clip 1
Source:
“Friends & Rivals”; Trials of Life

Common misperception that territoriality and dominance are the same thing; important to distinguish between the two concepts (different physiological basis)

NOTE: for solitary species, group size = 1 individual (e.g. ocelot, cougar)
H1: Stable group - depends “in group” “out group” dynamics

- In group: stable hierarchy
  - family: parents & offspring
  - no turnover in membership
  - each learns what to expect from others
- Out group: contest of strength
  - family groups gather on lake during migration
  - contests between families over resources
  - bigger, stronger families win over singles & smaller families

Q6.2

The stable relations for swans are within the family group. The relations between family groups are unstable and less predictable.

Social Structure - 3 hypotheses

- H1: In stable groups, conflict is predictable
  - e.g. pecking order in chickens
- H2: In unstable groups, conflict depends on friends & rivals
  - e.g. appeasement & grooming in baboons
- H3: In social insects, castes are fixed (nutrition)
  - no conflict e.g. Leaf cutter ants

H1: Stable “closed” group - peck order in chickens

Closed group at the time of this video. The relationships were established as each new chicken was added to the group and was pecked by the others.

Source: Trials of Life “Friends & Rivals”
H1: Stable group⇒ “peck order”

- **Alpha** - 1 hen pecks all others
- **Beta** - “second in command”
  - pecked by alpha
  - pecks all others
- **Omega** - “bottom of hierarchy”
  - pecked by all others
  - does not peck back
- Stability depends on order of entry into group- younger new ones are pecked

Fits linear hierarchy model

How does this apply to wolves? If a pack starts with the parents and each successive litter added year by year, then the pack is likely to be stable. The result will be an “age-graded” hierarchy based more on food begging than conflict.

If a bunch of siblings are raised without parents, the hierarchy is likely to be based more on escalation and de-escalation. If it is an open and group and pups are added, it is likely to be unstable.

If you want to create a stable group, add the members one at a time. Let them establish a predictable relationship before adding the next member.

Baboons are adapted to a fluctuating environment; a lot of turnover in the groups. Males leave natal group and join other group, then work their way “up the hierarchy” (FP)

Source: Trials of Life “Friends & Rivals”

H2: Instable relations- “open” group of baboons

Clip 3
Source: “Friends & Rivals”: Trials of Life

Minor conflict changes as old males “retire”, young enter group, learn what to expect

Source: Trials of Life “Friends & Rivals”

H2: De-escalation stabilizes relations

Clip 4
Source: “Friends & Rivals”: Trials of Life
H2: Baboons - age affects instability

- females
  - youngest daughter supported by mother
  - older daughters drop in rank
- males
  - leave mother’s group, enter a new group
  - form alliance with females, appease males
  - rise in rank as older males weaken or die

Branched model of social structure
Conflict in male relationships are shaped by different experiences in contrast to female relationships.

H3: Fixed strategy - leaf cutter ants

The behavior of leaf cutter ants is highly heritable. Each caste has a role, in harvesting leaves and caring for a fungus garden inside the network of burrows.

Source: Trials of Life “Friends & Rivals”

H3: Stable castes - fixed social roles

Each caste behaves differently due to nutrition during development

Source: Trials of Life “Friends & Rivals”
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H3: Ant castes - “hard wired roles” do not change during lifetime

- diploid (fertilized) - females
  - largest - reproductive queen
  - large - soldiers
  - small - workers (brood care, foragers)
  - dependent on nutrition at a critical stage of development
- haploid (unfertilized) - males
  - produced near the end of queen’s life
  - mate (3-4 with one queen), then die

Circle model

Relationships are very predictable, but are not based on conflict. Soldiers interact more with other soldiers, workers with workers, and all are influenced by the pheromones of the reproductive queen. Male drones interact very little, although they are cared for by the brood workers until these males disperse to breed with a queen from another colony.

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SUMMARY: Social structure (stability) Q6.1, Q6.2

- distinguish between
  - out-group intense combat (e.g. defense of territory)
  - in-group mild conflict (e.g. hierarchy)
- 3 hypotheses of social structure
  - H1: Stable groups => predictable conflict in “closed” groups
  - H2: Unstable groups => friends & rivals change in “open” groups
  - H3: Social insects => castes fixed by nutrition

Learning Objective
- In vs. out-group (PC)
- Social structure (PC)

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Action Items - Social structure: stability/instability

- Prepare answers for
  - Q 6.1. How do hierarchical relations in stable groups....
  - Q 6.2. What are 3 hypotheses about structure...
- Some recommended searches on Web of Science:
  - Waddington Sarah J “leaf-cutting ants”
- Recommended searches on scholar.google.com
  - “dominance hierarchy” sort for [since 2000]
  - “social structure primates” sort for [since 2000]
  - “dominance mongooses”
  - “animal social networks”
- Dialogue
  - Volunteer to chat on Q6.1, Q6.2
  - Post examples/sources to Blog2 Unit 6
6.2 Social Function: access to resources

Dr. Jane M. Packard
j-packard@tamu.edu

Learning goals
• Hierarchy hypotheses (UF)
• Hierarchy example (UF)

FUNCTION: Hierarchy is an adaptation to a changing environment

- H1: In hard times (e.g., wolves, dwarf mongoose)
  - parents that controlled access to food were more likely to reproduce
  - offspring that dispersed, gained access to resources (or died)

- H2: In severe environments (e.g., mole rats, termites, honeybees)
  - those that dispersed lost access to resources (genotype "edited out")
  - those "biders" that stayed home, survived but were malnourished

- H3: When parent(s) died in a social group (e.g., all of above species)
  - some biders had a chance to reproduce, although many did not
  - genotype for "bidding" persisted in the gene pool even though many "biders" never reproduced (genotype was not "edited out")
  - In good times, the "switcher genotype" that retained the physiological ability to reproduce would have increased in the population

Slide 3
H1 & H2: Naked mole rats - harsh environmental stressors

Fits the severe environment model

Clip 7
Source:
"Friends & Rivals":
Trials of Life
H3: Naked mole rats - youngsters are biders (dispersors died)

Those that bided their time survived better than those that dispersed and died in the severe desert conditions outside.

Concept of hierarchy applied to naked mole rats

<table>
<thead>
<tr>
<th>STRUCTURE (PC)</th>
<th>FUNCTION (UF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>breeding female</td>
<td>produced many “expendable workers”</td>
</tr>
<tr>
<td>soldiers (large males &amp; females - could become breeders)</td>
<td>group defense - waited until queen died to fight for dominance</td>
</tr>
<tr>
<td>young workers (reproductively suppressed by breeder’s scent)</td>
<td>group access to tubers in dry region-individuals benefited</td>
</tr>
<tr>
<td></td>
<td>those that dispersed did not survive predators</td>
</tr>
</tbody>
</table>

Best fits the hypothesis of adaptation to a harsh environment.

Sources: Rodney Honeycutt, J. Jarvis

SUMMARY: Social function (resources)

- Structure of naked mole rat groups:
  - slow rate of population growth in relation to scarce resources
  - rapid expansion when environment changed

- Alternative working hypotheses
  - H1: in hard times, older dominants reproduced better
    - Conditional decisions about sharing resources with offspring
    - Conditional decisions about dispersing from family group (FP)
  - H2: in severe environments, younger biders survived better
    - Fixed decision of no dispersal
    - Conditional decision of “suppression” related to urine odors
  - H3: if breeder died, then dominant bidder switched to reproducing

Learning goals
- Hierarchy hypotheses (UF)
- Hierarchy example (UF)
Action Items - Social function: access to resources

- Prepare answers for
  - 6.3. What are 3 hypotheses about function….
  - 6.4. Function of social structure for one species….
- Some recommended searches on Web of Science:
  - Honeycutt, R “mole rat”
  - Jarvis, J* “naked mole rat”
- Recommended searches on scholar.google.com
  - “naked mole rat”
- Dialogue
  - Volunteer to chat on Q6.3, Q6.4
  - Post examples/sources to Blog2 Unit 6
Learning goals
• Repro suppression (PC)
• Manage species (PC)

How would you apply your understanding of social conflict to managing a social species of your choice?

Important to distinguish between the major stress in unstable groups (which may lead to reproductive failure & intense combat) and the minor conflict in stable groups, which is not stressful (depends on group composition)

SOURCE: Sapolsky, Robert M.

Source: “Friends & Rivals” Trials of Life
In closed groups of wolves, individuals learn to assess when to escalate and when to de-escalate. We have no evidence that there is physiological suppression of reproduction. Biders remain healthy until an opening in the breeding role appears (e.g. after a territorial fight with neighbors).

Without parents, one sibling may escalate and another may be physiologically stressed, (due to poor nutrition, injury), show delayed maturation and be more likely to disperse.

TIP: See links on wolf inquiry webpage Google “natures partners predators”
**Slide 4**

**H2. Instable groups - Dwarf mongoose immigrants**  

Females immigrate in from natal group, not likely to breed until they are older. Immigrants may help care for breeding female’s young (“nanny role”). Conflict between females when they do breed.

Key author: Rood, Alan; Rasa, Ann  
Source: “Friends & Rivals” Trials of Life

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**Slide 5**

**H3: Asocial - ocelot (intolerant of social stressors)**

The solitary cats have less of a repertoire of communication signals with a function of appeasement (de-escalation). They avoid each other in time, if not in space. If forced to remain together in captivity, they can become physiologically stressed. The asocial species do not learn to assess (as well as the social species) and are more likely to escalate than de-escalate.

Source: “Friends & Rivals” Trials of Life

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**Slide 6**

**SUMMARY: Stress, health & reproduction**

- **continuum of more to less social:** dwarf mongoose, wolves, ocelot
  - H1: Stable groups - stressors within comfort range
  - H2: Instable groups - stressors beyond comfort range
  - H3: Asocial species: no resistance to social stressors

- **applied management:** consider social structure
  - To create a stable hierarchy, add one individual (litter) at a time
  - When there is a change in the social group, watch for signs of mutual escalation (symmetric) and/or distress (asymmetric)
  - Separate individuals before mild conflict escalates to intense combat

Learning goals
- Repro suppression (PC)
- Manage species (PC)
Action Items - Stress, health & reproduction

- Prepare answers for
  - 6.5. Cause of social hierarchy in a species….
  - 6.6. Managing a species…apply understanding of social conflict….

- Some recommended searches on Web of Science:
  - Wingfield JC (birds, reproduction)
  - Sapolsky RM (baboons, primate)
  - Abbott, DH (primates, subordinates, stressed)

- Recommended searches on google.scholar.com
  - Creel S (suppression, social carnivores, fish)
  - Rood, Alan; Rasa, Ann (dwarf mongoose)

- Dialogue
  - Volunteer to chat on Q6.5, Q6.6
  - Post examples/sources to Blog2 Unit 6