Space use and home range overlap of least chipmunks in the Laramie Range

Sara Locker, Garrett Smith, and Merav Ben-David
Department of Zoology and Physiology
University of Wyoming
Body mass, which represents the energy demands of animals, has been identified as an important predictor of home range size in many terrestrial and marine mammals.

Tucker, Ord, & Rogers, (2014)
In most studies, only interspecific effects of body size have been explored but few addressed the effects of sexual dimorphism within species.

Garland, Dickerman, Janis, & Jones (1993)
Home range size in mammals depends on habitat quality

Home range size of fishers (Martes pennanti) is higher in the Rocky Mountains where habitat quality is lower

Zielinski, Truex, Schmidt, Schlexer, Schmidt, & Barrett (2004)
Least chipmunks inhabit both forest and sagebrush habitats in the Laramie Range, Wyoming, but abundance is higher in forest stands.
Female-biased sexual size dimorphism is typical in most chipmunk species, including the least chipmunk (*Tamias minimus*).
Annual cycle

- **January**: Hibernation

- **October**: Preparation for hibernation

- **April**: Arousal

- **July**: Breeding
We hypothesized that:

1. Male *T. minimus* individuals will have smaller home ranges than females.
2. Home range size differences between male and female chipmunks will be more pronounced in sagebrush (more extreme) habitats.
3. There will be less overlap of home ranges in sagebrush habitats.
Study Area

• 21 km E of Laramie in Medicine Bow National Forest.
• Elevation $\to \sim 2600$ m.
• Climate $\to$ semi-arid continental.
• 6 grids: 3 sagebrush and 3 forest.
  – Sagebrush species: Mountain big sagebrush, scattering Limber pine.
Trapping procedures

- Tomahawk live traps – (Model 102).
- Baited with peanut butter, oatmeal, molasses, apples, and strawberries.
- Left open during day (6:30AM-4:00PM).
- Each grid trapped for 5 consecutive days.
Check for PIT tag

- Anesthetized
- Sexed
- Weighed
- PIT tag inserted
- Blood collected

NO

YES

Animal released
Select individuals \((n=32)\) were fitted with a radio-collars.

ATS model M140
0.75g
Tracking conducted daily from Sept 7 to Oct 16, 2015
Sampling scheme

8/24/15  8/31/15  9/7/15  9/14/15  9/21/15  9/28/15  10/5/15  10/12/15  10/19/15
Forest trapping
Sagebrush trapping
Tracking F2 & S2
Tracking F1
Tracking S1

Legend:
- Forest trapping
- Sagebrush trapping
- Tracking F2 & S2
- Tracking F1
- Tracking S1
<table>
<thead>
<tr>
<th>Calculated</th>
<th>Details</th>
<th>Analysis</th>
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<tbody>
<tr>
<td>Home range</td>
<td>Size of home range (ha) for male and females by habitat type</td>
<td>Minimum convex polygon (MCP) and Kernel utilization distribution (KUD) (Program R)</td>
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<tr>
<td>Body mass</td>
<td>Body mass (g) of male and females by habitat type</td>
<td>Compare between sexes and habitats with ANOVA</td>
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## Sample sizes

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Males</th>
<th>Females</th>
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<tbody>
<tr>
<td>Forest</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Sagebrush</td>
<td>7</td>
<td>6</td>
</tr>
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![Graph showing maximum distance (m) for males and females in forest and sagebrush habitats.](image-url)
Home range sizes of chipmunks based on MCP ranged from 0.59-1.1 ha.
Core areas (50% KUD) in forest coincided with hotspots of trapping, but less so in sagebrush.
Home range size based on 50% contours with KUD were similar to MCP and larger with 75% and 95% contours. No differences between sexes or habitats.
Core areas (50% KUD) of both sexes showed little overlap. This segregation persisted for females in the 95% contours. Males exhibited higher overlap with females and other males. There were no habitat differences in overlap.
Most animals caught in sagebrush moved to forest or wooded sections of their home range prior to hibernation. Two pairs hibernated together.
Chipmunks entered hibernation at the end of September early October

Animals entered hibernation as evident from signal attenuation (deep underground)
We found that:

1. Male *T. minimus* individuals had similar home ranges to females.

No. Although chipmunks were heavier in 2015 (especially in the forest), sex differences persisted.

Was body mass of males similar to females in 2015?
We found that:

1. Male *T. minimus* individuals had similar home ranges to females.

2. Home range size differences between male and female chipmunks were not more pronounced in sagebrush (more extreme) habitats.

But there were fewer individuals in sagebrush, especially in Sagebrush grid 1.
We found that:

1. Male *T. minimus* individuals had similar home ranges to females.
2. Home range size differences between male and female chipmunks were not more pronounced in sagebrush (more extreme) habitats.
3. There was similar overlap of home ranges in forest and sagebrush habitats.

But females exhibited intra-sexual territoriality.
Group and intra-sexual territoriality (in which both sexes avoid/repel same-sex conspecifics) is common in sciurids.

- California ground squirrels (*Otospermophilus beecheyi*)
- Gunnison prairie dogs (*Cynomys gunnisoni*)
- White-tailed prairie dogs (*Cynomys leucurus*)
- Red squirrels (*Tamiasciurus hudsonicus*)
- Woodchucks (*Marmota monax*)

Intra-sexual territoriality of females only is rare

- Eurasian red squirrels (*Sciurus vulgaris*)

and merits further investigation
Communal hibernation occurs in several sciurid species:

- Northern flying squirrels (Glaucomys sabrinus)
- Alaska marmot (Marmota broweri)

Communal hibernation has not been documented in chipmunks before and merits further investigation.
Additionally, in the future:

- Chipmunks should be trapped in areas with continuous sagebrush habitats to determine if home range size and overlap in truly extreme environments would be more or less pronounced.
Additionally, in the future:

- Genetic relatedness of chipmunks should be assessed in relation to home range overlap and communal hibernation.
- Effects of annual changes in resource availability on home range size and overlap should be investigated.
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Questions?